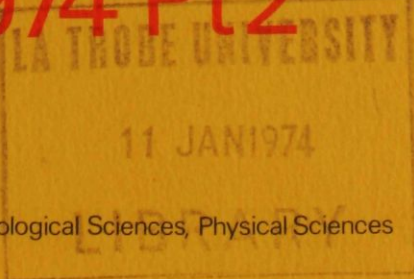


# La Trobe University

## Handbook 1974 Pt 2

Schools of Behavioural Sciences, Agriculture, Biological Sciences, Physical Sciences



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# La Trobe University Handbook 1974

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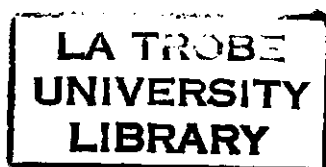
SCHOOLS OF AGRICULTURE  
BEHAVIOURAL SCIENCES  
BIOLOGICAL SCIENCES  
PHYSICAL SCIENCES

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## ADDENDUM

### BEHAVIOURAL BIOLOGY IT (1 unit)

**Syllabus:** The course aims to give a biological background for behaviour studies in Psychology II: an introduction to the structure and function of cells; the basic principles of genetics; the genetics of behaviour; evolution and natural selection; the evolution of mammals; mammalian physiology; animal ethology.

**Prerequisites:** Nil. Confined to students also taking Psychology I.

**Class Requirements:** Three one-hour lectures a week for three terms. One tutorial a week for the genetics component (first term), demonstration and practical sessions in association with the other components.

#### Prescribed Reading

Adams, P. *et al. Biology Today* CRM Book, California, 1972

#### Recommended Reading

Parsons, P.A. *The genetic analysis of behaviour* Methuen, London, 1967

Taylor, G.R. *The Science of Life* Panther paperback, London, 1967

Others may be recommended during the course.

## ERRATUM

### Page 10

The entry for Professor R.J. Magee (inorganic and analytical chemistry) should read:

**Professor Magee, R.J.** B SC, M SC (QUB), PH D, D SC (EDIN), FICI, FRIC, FRSH, FRACI, *Chairman*

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## PART I: INTRODUCTION

### THE VISITOR

His Excellency the Governor of Victoria, Maj.-Gen. Sir Rohan Delacombe,  
KCMG, KCVO, KBE, CB, DSO, K ST J

### MEMBERS OF COUNCIL (as at August 1973)

The Hon. Mr Justice Smithers *Chancellor*

Mr J.D. Norgard *Deputy Chancellor*

Dr D.M. Myers *Vice-Chancellor*

Mr K.A. Aickin, QC

Mr J.J. Bayly

Professor B.D. Ellis

The Hon. J.W. Galbally, QC, MLC

Mr A.J. Gorman

Mr W.H. Hartley

The Hon. W.V. Houghton MLC

Dr C.A. Lamp

Dr P.G. Law, CBE

Dr M.N. Lovegrove

Rev. Dr J.D. McCaughey

Dr Lotte Mulligan

Mr W.G. Philip

Mr B. Pola

Mr P.J. Saulwick

Mr C.G. Sceney

Dr L.W. Shears

Mrs C. Storey

Mr P.N. Thwaites

Professor R.D. Topsom

Mr C.C. Trumble

Mr K.H. Vial CBE

Professor A.B. Wardrop

Mr M.S. Whiting, MLA

Mr M.H. Winneke

Professor H.A. Wolfsohn



## OFFICERS OF THE UNIVERSITY

*Vice-Chancellor* D.M. Myers, B SC, D SC ENG, SYD, FIEE, FIE AUST, F INST P

*Registrar* Maj.-Gen. T.S. Taylor, CBE, MVO, MC

*Business Manager* J.C. Janicke, BA, DIP ED (MELB)

*Chief Librarian* D.H. Borchardt, MA (NZ), DIP NZ LIB SCH, ALA (UK), FLAA

## TERM DATES — 1974

### FIRST TERM

(10 weeks)

11 March

18 May

### SECOND TERM

(9 weeks)

10 June

10 August

### THIRD TERM

(7 weeks)

2 September

19 October

Examinations begin 4 November.

### Note

1. The one-year Diploma in Education course commences on 26 February and Education II (concurrent course) commences on 28 February.
2. Some departments may require students to attend the University for out-of-term activities as part of the courses offered.

## ENQUIRIES

All enquiries should be directed to:

The Registrar,

La Trobe University,

Bundoora,

Victoria, 3083.

Telephone enquiries: 478 3122

Admission enquiries: Extension 2738.

## ACADEMIC STAFF

### SCHOOL OF AGRICULTURE

<i>Dean</i>	Professor R.L. Reid
<i>Professor</i>	Reid, R.L. B SC AGR (SYD), PH D (CANTAB), FRSE, <i>Chairman</i>
<i>Senior Lecturers</i>	Connor, D.J. B ARG SC, PH D (MELB) Foster, W.N.M. MA, D PHIL (OXON), BVM&S, MRCVS Lamp, C.A. M AGR SC (MELB), PH D (TAS) Leaver, D.D. B V SC (SYD), M SC, PH D (MELB) Quilkey, J.J. B EC (SYD) Willatt, S.T. B SC (WA), M SC (NSW)
<i>Lecturers</i>	Boston, R.C. M SC, PH D (MELB) Cranwell, D.D. B AGR SC, M AGR SC (MASSEY) Dumsday, R.G. B AGR SC (MELB) Luke, R.K.J. B AGR SC (MELB), PH D (ANU) Uren, N.C. B AGR SC, PH D (MELB)
<i>Senior Demonstrator</i>	Towns, Kristin, M. B AGR SC (MELB)
<i>Demonstrators</i>	Lane, D.W.A. B AGR SC (TAS) Weber, Kathryn M B AGR SC (LA TROBE)

### SCHOOL OF BEHAVIOURAL SCIENCES

<i>Dean</i>	Professor G. Singer
-------------	---------------------

### DEPARTMENT OF PSYCHOLOGY

<i>Professor</i>	Singer, G. MA, PH D (SYD), FAPsS <i>Chairman</i>
<i>Senior Lecturers</i>	Francis, R.D. BA, MA (NZ), MA (MELB), DIP CRIM (CANTAB) Ng, K.T. BA, PH D (SYD)
<i>Lecturers</i>	Coleman, G.J. BA (SYD) Gibbs, Marie E. B SC (MELB), PH D (MON) McKenzie, Beryl E. BA (MELB), PH D (MON) Montgomery, R.B. BA (SYD), PH D (MACQUARIE) Wallace, Meredith BA (SYD)

### SCHOOL OF BIOLOGICAL SCIENCES

<i>Dean</i>	Professor P.A. Parsons
-------------	------------------------

## BIOCHEMISTRY

<i>Professor</i>	Stone, B.A. B SC (MELB), PH D (LOND) <i>Chairman</i>
<i>Senior Lecturers</i>	Holmes, R.S. B SC, PH D (QLD) Scopes, R.K. BA, PH D (CANTAB)
<i>Lecturer</i>	Polya, G.M. B SC (TAS), PH D (FLINDERS)
<i>Senior Demonstrator</i>	Phillips, D.R. B SC, PH D (ADEL)
<i>Demonstrator</i>	Stewart, A.A. B SC (ANU)

## BOTANY

<i>Professor</i>	Wardrop, A.B. M SC (TAS), PH D (LEEDS), D SC (MELB), <i>Chairman</i>
<i>Senior Lecturers</i>	Anderson, J.W. B AGR SC, PH D (MELB) Griffiths, D.A. B SC, PH D (WALES), FLS Griffiths, D.J. B SC, PH D (WALES) Parsons, R.F. B SC (ADEL), PH D (MELB) Staff, I.A. M SC, DIP ED (SYD), PH D (S ILL)
<i>Lecturers</i>	Pallaghy, C.K. B SC (MELB), PH D (TAS) Whiffin, T.P. MA (CANTAB), PH D (TEXAS)
<i>Hon. Research Fellow</i>	Lee, Helen M SC (MELB)
<i>Senior Demonstrator</i>	Wong Hee, K. B SC (LA TROBE)

## GENETICS AND HUMAN VARIATION

<i>Professor</i>	Parsons, P.A. B AG SC (ADEL), M SC (MELB), PH D (CANTAB) <i>Chairman</i>
<i>Reader</i>	Vacant
<i>Lecturers</i>	Fripp, Yvonne J. B SC AGR (SYD), PH D (BIRM) Graves, Jennifer M. M SC (ADEL), PH D (CALIF) Hay, D.A. MA (ABERDEEN), PH D (BIRM) Hynes, M.J. B AG SC (ADEL), PH D (FLINDERS) Mac Bean, I.T. B SC (MELB), PH D (LA TROBE) Mac Phee, D.G. B SC, PH D (EDIN) Murray, N.D. B SC, PH D (SYD) Westerman, M. B SC, PH D (BIRM)
<i>Research Fellow</i>	McKechnie, S.W. B SC PH D (SYD)
<i>Senior Demonstrators</i>	Chew, Guat Kin B SC (MELB) Rose, Astrid B SC, DIP ED (MELB) White, N.G. B SC (LA TROBE)

## ZOOLOGY

<i>Professor</i>	Thornton, I.W.B. B SC, PH D (LEEDS) <i>Chairman</i>
<i>Senior Lecturers</i>	Danthanarayana, W. B SC (CEYLON), PH D (LON), DIC Marshall, A.T. B SC (LEEDS), PH D (HK), DIC New, T.R. B SC, PH D (LOND), ARCS, DIC Woolley, Patricia A. B SC (WA), PH D (ANU) Wright, A. B SC, PH D (LIV)
<i>Lecturers</i>	Rawlinson, P.A. B SC (MELB) Warren, Anne A. B SC (SYD), PH D (CANTAB) Zann, R.A. B SC, DIP ED (NE), PH D (QLD)
<i>Research Fellow</i>	Beattie, T.M. B SC, PH D (TAS)
<i>Senior Demonstrator</i>	McCallum, Frances. M.E. MA, B SC (OXON)

## SCHOOL OF EDUCATION

<i>Dean</i>	Professor B. Crittenden
<i>Sub-Dean</i>	Mr S. Oates

## CENTRE FOR COMPARATIVE AND INTERNATIONAL STUDIES IN EDUCATION

<i>Reader</i>	Lovegrove, M.N. BA (NZ), MA, PH D (AUCK), DIP TEACH (ATC) ABPsS, MIAAP <i>on leave</i>
<i>Senior Lecturers</i>	Bessant, B. BA, M ED (MELB), PH D (MON) Price, R.F. B SC, PH D (LOND), MI BIOL <i>Chairman</i> Sheehan, B.A. B COMM, B ED (MELB), MA (LOND)
<i>Lecturers</i>	Burns, Robin BA (SYD), M SC (MON) Collins, K. B ED (WA), MA (ALBERTA), PH D (MICH) Simkin, K. BA, B ED (MELB), MA (TORONTO)

## CENTRE FOR THE STUDY OF EDUCATIONAL COMMUNICATION AND MEDIA

<i>Senior Lecturers</i>	Edgar, Patricia M. BA, B ED (MELB), MA (STAN) Newton, R.A.C. B COMM (MELB), MA (STAN)
<i>Lecturers</i>	Drummond, P.A. BA (MON) ATTI (DIP-MERCER HOUSE) Flaus, J.W. BA (SYD) Mills, R.I. BA (SYD), MA (ADEL), PH D (WISC) <i>Chairman</i> Lapinski, Rita M. BA (MISSOURI), PH D (CALIF)

## CENTRE FOR THE STUDY OF INNOVATION IN EDUCATION

<i>Reader</i>	Turner, M.L. B SC, B ED (MELB), MA, ED D (CALIF)
<i>Lecturers</i>	Mathews, Rivkah, BA, B ED, M ED (MELB) Szorenyi-Reischl, N. BA (ADEL), MA (MELB) Wesson, Gwenneth BA, B ED (MELB) White, D.C. B SC, B ED (MELB), TPTC
<i>Senior Tutors</i>	Goodman, P.B. BA (MELB), DIP ED (LA TROBE) Hinkson, J. B COMM (QLD)

## CENTRE FOR THE STUDY OF TEACHING

<i>Reader</i>	Lett, W.R. BA, B ED (MELB), PH D (CALIF) <i>Chairman</i>
<i>Lecturers</i>	Brown, A.J. BA, B ED (MON), TPTC Duckers, A. B SC (LOND) Gasson, I.S.H. DIP PHYS ED (LEEDS), B ED (BR COL) M SC (WASH), PH D (OHIO) Hubbard, R.S. BA (STAN), MA, PH D (CLAREMONT) Neville, B. BA, MA (ADEL) Rado, Marta PH D (BUDAPEST), DIP ED (MELB)

## CENTRE FOR THE STUDY OF URBAN EDUCATION

<i>Professor</i>	Craft, M. B SC ECON (LOND), P/G DIP (DUBLIN) ACAD DIP ED (LOND), PH D (LIV) <i>Chairman</i>
<i>Senior Lecturers</i>	Claydon, L.F. DIP ED, MA (BRIST), MA (LOND) Knight, A. B SC, M SC, PH D (OREGON) Poole, Millicent E. BA, B ED (QLD), MA (UNE), PH D (LA TROBE) Toomey, D.M. BA (MANC), DIP ED (LEEDS), MA (KENT)
<i>Lecturer</i>	Lever, Constance BA, MA (LOND)
<i>Senior Tutors</i>	Hampel, B. BA, DIP ED (MELB), ASSOC LOND INST ED Roberts, A.J. BA (BIRM), MA (LANC)

## SCHOOL

<i>Professors</i>	Crittenden, B. BA, MA (SYD), PH D (ILLINOIS) Goldman, R.J. BA (MANC), MA (CHIC), MA, PH D (BIRM), NFF DIP FBPsS <i>on leave</i>
<i>Senior Lecturer</i>	Oates, S. BA, BED (MELB), TPTC
<i>Senior Tutors</i>	Marsh, Barbara B SC (MELB) Shelley, Nancy BA (MELB), B ED (LA TROBE) Willis, J.C. B COMM, DIP ED, M COMM (MELB)

## SCHOOL OF HUMANITIES

*Dean* Professor J.A. Salmond

### ENGLISH

*Professors* de Chickera, E.B. BA (LOND), B LITT (OXON)

Marsh, D.R.C. BA PH D (NATAL) *Chairman*

*Readers* Barnes, R.J. MA (MELB), MA (CANTAB)

French, A.L. MA, M LITT (CANTAB)

*Senior Lecturers* Burns, G.J. MA (MELB)

Gribble, Jennifer M. MA (MELB), B PHIL (OXON)

*on leave*

Kearney, G.M. BA (KEELE), M LITT (LANC)

Rawlinson, D.H. MA (CANTAB), AM (STAN)

Wiltshire, J.A. BA (CANTAB)

*Lecturers* Blake, Ann MA, B LITT (OXON)

Clancy, L.J. BA (MELB)

\*Frost, A.J. MA (QLD), AM, PH D (ROCH)

Frost, Lucile BA (WILSON COLLEGE), AM, PH D (ROCH)

Gardiner, N.B. BA (HCNY), MA (ARIZ), PH D (LOND)

Hancock, Susan M. MA (CANTUA), MA (OXON)

*on leave*

Henry, G.B.M. BA (MELB), MA (SYD)

Jones, D.G.H. MA (CANTAB) *on leave*

Richards, M.E.A. MA (AUCK)

Rodriguez, Judith C. BA (QLD), MA (CANTAB)

*on leave*

Stanyon, C. BA (KEELE)

Watson, C.J. BA (MELB), PH D (BR COL)

Wightman, Jennifer A. MA (ADEL)

*Senior Tutors* Collits, T.J. MA (SYD), DIP ED (NEWCASTLE)

Merli, Carolyn A. BA (MELB)

*Tutors* Westcott, R. BA (MON), DIP ED (MONASH)

Wright, J.M. BA (MELB)

\*Joint appointment with Department of History

### HISTORY

*Professors* Gregory, J.S. MA (MELB), PH D (LOND) *Chairman*

Martin, A.W. MA, DIP ED (SYD), PH D (ANU)

Salmond, J.A. MA (OTAGO), PH D (DUKE)

*Readers*

Mulligan, Lotte MA (MELB), PH D (ADEL)

Phillipp, June M. MA, PH D (MELB)

*Senior Lecturers*

Ahmad, Z. BA (CALCUTTA), BA (LOND), B LITT (OXON)

Barrett, J. BA (ADEL), PH D (ANU)

Breen, W.J. BA (MELB), MA, PH D (DUKE)

Haydon, A.P. BA (ADEL), MA, PH D (YALE)

Hirst, J.B. BA, PH D (ADEL) *on leave*

Isaac, R.L. BA (CAPETOWN), MA (OXON) *on leave*

Johanson, D.F.C. BA (MELB), MA (OXON)

Phillips, W.W. BA (ADEL), PH D (ANU)

Stremski, R.R. BS (LOYOLA), MS, PH D (WISCONSIN)

Tyrrell, A.A. MA (EDIN), MA (MCMASTER) *on leave*

Ward, A.D. MA (NZ), PH D (ANU), *on leave*

*Lecturers*

Barta, A.A. MA (OTAGO)

Carr, B. MA (OXON)

Cashmere, J.J. BA (NSW), DIP ED (SYD), MA (TAS)

Clendinnen, Inga V. MA (MELB)

Cook, P.S. B EC, BA (ADEL), PH D (ANU)

Disney, G. MA (OXON), DIP ED (MELB), MA, PH D (HARV)

Douglas, Bronwen P. BA (ADEL), PH D (ANU), DTS

Dunning, T.D. MA, PH D (CALIF)

Ferrell, D. MA ((UNC), PH D (ANU)

\*Frost, A.J. MA (QLD), PH D (ROCH)

Graham, J.K. BA (MON)

Hammerton, A.J. BA (SIR G. WMS), PH D (BR COL)

Huish, D.J. BA (CANTAB), PH D (ANU)

Jeffcott, C.A. BA (NZ), BA (OXON), PH D (ANU)

Johnson, R.A. BA (MELB)

Kent, Dale V. BA, DIP ED (MELB), PH D (LOND)

Martell, W.H.T. BA, DIP ED (MELB)

Murray, W.J. BA (ADEL), PH D (ANU)

Potts, D.J.E. MA (MELB), TPTC

Richards, Judith MA (AUCK)

Schultz, R.J. BA (IOWA), MA (OMAHA), PH D (ANU)

Spear, T. MA (WISCONSIN)

*Senior Tutors*

Campbell, Joan MA (MELB)

Jackson, H. BA (MELB & CANTAB), LLB (MELB)

Prest, Jean MA (ADEL)

Watts, R.W. BA (LA TROBE)

<i>Tutors</i>	Douglas, C.W.S. BA (ADEL) Ishemo, W. MA (CANTAB) McKenzie, L. BA (MELB) *Joint appointment with Department of English
---------------	--

## ART HISTORY

<i>Professor</i>	Tomory, P. MA (EDIN) <i>Chairman</i>
<i>Lecturer</i>	Ellem, Lucy M. MA (YALE)
<i>Tutor</i>	Uhl, C.D. BA, MA (MELB)

## MODERN LANGUAGES

### French

<i>Professor</i>	Forsyth, E.C. BA, DIP ED (ADEL), DU (PARIS), FAHA OFFICIER DES PALMES ACADEMIQUES
<i>Senior Lecturers</i>	Hooke, R.L.G. BA (MELB), MA (ESSEX) Paradissis, A.G. BA (LOND), MA, PH D (MELB), L EN D (L'AUREORE, SHANGHAI)
<i>Lecturers</i>	Inserra-Schutte, Marie-France M ES L (PARIS) Masterman, Lindis E. BA (MELB), DES (PARIS)

### Spanish

<i>Professor</i>	Thompson, R.W. MA (DUBLIN)
<i>Lecturers</i>	Rodriguez, F. L EN L (MANIZ), DIP EN LIT HISPANO- AMERICANO (CARO Y CUERVO) Scarfe, F.H.B. MA (OXON), DIP DE ESTUDIOS HISPANICOS (SALAMANCA)
<i>Instructor</i>	Sangiau, J.M.
<i>Senior Tutor</i>	Valiente, M.R. LICDO EN LETRAS (ZARAGOZA)

## PHILOSOPHY

<i>Professors</i>	Ellis, B.D. B SC, BA (ADEL), B PHIL (OXON), FAHA <i>Chairman</i> McCloskey, H.J. MA, PH D (MELB)
<i>Reader</i>	Smart, J.J.C. MA (GLAS), B PHIL (OXON), FAHA
<i>Senior Lecturers</i>	Hyslop, A. MA (ADEL) Jackson, F.C. B SC, BA (MELB) McCullagh, C.B. BA (SYD), MA, PH D (CANTAB) Mitchell, Dorothy J. MA (MELB), B PHIL (OXON) Oakley, I.T. BA (MELB), B PHIL (OXON) Pinkerton, R.J. BA (SYD), B PHIL (OXON)



	Richards, T.J. MA (WELL), D PHIL (OXON), FRAS <i>on leave</i>
<i>Lecturers</i>	Brady, R.T. B SC (SYD), MA (NE), PH D (ST AND) Cann, M.R. BA, B MUS, AUA (ADEL) Fox, J.F. BA (MELB), <i>on leave</i> Mackie, Alwynne MA, PH D (MELB) Murphy, C.P. BA (SYD) Pargetter, R.J. B SC, MA (MELB), DIP ED (MON)
<i>Senior Tutors</i>	Phillips, R.G. BA (QLD) von Thun, M. BA, PH D (SYD) Fleming, P.J. MA (MELB) Fox, R.A. LL B, MA (MELB) Lucas, G.J. BA (POMONA, CALIF), MA (NEW MEXICO)

## SCHOOL OF PHYSICAL SCIENCES

<i>Dean</i>	Professor R.J. Magee
-------------	----------------------

## INORGANIC AND ANALYTICAL CHEMISTRY

<i>Professor</i>	Magee, R.J. B SC, M SC (QUB), PH D, B SC (EDIN), FICI, FRIC, FRSH, FRACI, <i>Chairman</i>
<i>Senior Lecturers</i>	Cardwell, T.J. B SC, PH D (QUB), ARIC Cattrall, R.W. B SC, PH D (ADEL), ARACI O'Connor, M.J. B SC (ADEL), PH D (MON), ARACI
<i>Lecturers</i>	Hill, J.O. B SC (LOND), PH D (SURREY) Wedd, A.G. B SC, PH D (TAS)
<i>Research Fellow</i>	Grant, M.W. BA, PH D (CANTAB)
<i>Senior Demonstrators</i>	Krakovits, Emilia M. B SC (BUDAPEST), M SC (LA TROBE) Tariq, S.A. M SC (PANJAB), PH D (SOTON) ARACI

## ORGANIC CHEMISTRY

<i>Professor</i>	Topsom, R.D. M SC (NZ), PH D (LOND), FRIC, FRACI, FNZIC <i>Chairman</i>
<i>Senior Lecturers</i>	Davis, M. BA, PH D (CANTAB), ARACI, AMIREE Deady, L.W. M SC, PH D (CANTUA), ANZIC Ternai, B. B SC, DIP CHEM ENG (BUDAPEST), M SC (MELB), PH D (E ANGLIA), ARACI
<i>Lecturer</i>	Reiss, J.A. B SC, PH D (ADEL), ARACI
<i>Research Associates</i>	Brownlee, R.T.C. BA (CANTAB), M SC, PH D (E ANGLIA), ARACI

Broxton, T.J. B SC, PH D (WA)  
*Senior Demonstrator* Davy, J.R. B SC (NSW), PH D (FLIN), ARACI

## PHYSICAL CHEMISTRY

*Professor* Morrison, J.D. PH D, D SC (GLAS), FAA, FRACI  
*Chairman*  
*Senior Lecturer* Arthur, N.L. B SC, PH D (ADEL), ARACI  
*Lecturers* Christie, J.R. B SC, PH D (ANU)  
Mackay, Maureen F. B SC (SYD), PH D (MELB)  
Nyberg, G.L. B SC (WA), PH D (CANTAB)  
Peel, J.B. B SC, B ED (MELB), PH D (MON), ARACI,  
*on leave*  
*Research Associate* Smith, J.F. M SC (LA TROBE), ARMIT

## GEOLOGY

*Professor* White, A.J.R. B SC (ADEL), PH D (LOND) *Chairman*  
*Lecturers* Gray, C.M. B SC (ADEL), PH D (ANU)  
Kwak, T.A.P. B SC, M SC, (BR COL), PH D (McMASTER)  
Lindsay, J.F. M SC (NE), PH D (OHIO)  
*Demonstrator* Christie, D.M. B SC (ANU)

## APPLIED MATHEMATICS

*Professor* Eliezer, C.J. MA, PH D (CANTAB), M SC, D SC (LOND)  
BAR-AT-LAW (MIDDLE TEMPLE), FIMA *Chairman*  
*Senior Lecturers* Andrew, A.L. M SC (NZ), M SC (ANU), PH D (LA TROBE)  
Cohen, H.A. B SC (SYD), PH D (ANU)  
Johnston, R. B SC (GLAS)  
Ross, D.K. MA (MELB), PH D (MANC), FIMA  
Roy, S.K. M SC, PH D (PATNA), FIMA, F INST P  
\*Woodhouse, D. MA, D PHIL (OXON), M SC (E AF),  
MLMS  
\*Joint appointment with the Department of Pure  
Mathematics

## MATHEMATICAL STATISTICS

*Professor* Brockwell, P.J. BEE, BA, MA (MELB), PH D (ANU)  
*Chairman*  
*Senior Lecturer* Becker, N.G. M SC (MELB), PH D (SHEFF)  
*Lecturer* Basawa, I.V. MA (KARNATAK), PH D (SHEFF)

## PURE MATHEMATICS

<i>Professor</i>	Mond, B. BA (YESHIVA), MA (BUCKNELL), PH D (CINC) <i>Chairman</i>
<i>Visiting Professor</i>	Gilmer, R.W. B SC, M SC, PH D (LSU)
<i>Senior Lecturers</i>	Jones, A.R. MA, PH D (MELB) Pearson, K.R. BA PH D (ADEL) *Woodhouse, D. MA, D PHIL (OXON), M SC (E AF), MLMS
<i>Lecturers</i>	Davis, G.E. B SC, PH D (MON) Elton, G.C. M SC (NZ), PH D (ANU) Strantzen, J.B. B SC (MELB) Taylor, D.E. M SC (MON), D PHIL (OXON)
<i>Senior Tutor</i>	Gray, A.R. BA (MON)  *Joint appointment with Department of Applied Mathematics

## PHYSICS

*Chairman* Professor K.D. Cole

### Division of Electron Physics

<i>Professor</i>	Davies, D.E. B SC, PH D (WALES), F INST P, FAIP <i>Head</i>
<i>Senior Lecturers</i>	Jenkin, J.G. B SC (ADEL), PH D (ANU), AAIP Leckey, R.C.G. B SC, PH D (QUB), M INST P Lee, A.R. B SC (HK), PH D (LOND), M INST P Liesegang, J. B SC (QLD), D PHIL (OXON) AAIP
<i>Lecturers</i>	Miller, R.B. B SC, PH D (NE) Riley, J.D. B SC, B ENG (SYD), PH D (OXON)

### Division of Theoretical and Space Physics

<i>Professor</i>	Cole, K.D. M SC, DIP ED, D SC (QLD), FAIP, F INST P <i>Head</i>
<i>Honorary Reader</i>	Armstrong, E.B. B SC, PH D (QUB)
<i>Senior Lecturers</i>	Butcher, E.C. B SC, PH D (EXETER) Dyson, P.L. B SC, PH D (MELB) Essex, Elizabeth A. B SC, PH D (NE) McLaughlin, I.L. B SC, PH D (ADEL)
<i>Lecturer</i>	Kalotas, T.M. BE, M SC (NSW), D PHIL (SUS)
<i>Research Fellow</i>	Hammer, P.R. B SC, PH D (MELB)

## SCHOOL OF SOCIAL SCIENCES

*Dean* Professor E.K. Braybrooke

## ECONOMICS

### *Professors*

Burley, S.P. B SC, PH D (ADEL), MA, PH D (PRIN) *on leave*  
Davidson, F.G. MA (CANTAB)

Whitehead, D.H. MA (OXON) *Chairman*

### *Visiting Professor*

Domar, E.D. BA (CAL), MA (MICH), MA, PH D (HARV)

### *Senior Lecturers*

Anderson, J.L. BA (NE)

Burley, H.T. B EC (ADEL), MA, PH D (CANTAB)

Csapo, L. MA, PH D (BUDAPEST)

Horrigan, W. MA (WALES)

Schneider, M. BA (ADEL), M SC (CANTAB)

Stent, W.R. B AGR SC (MELB), DTA (TRIN), DIP AGR  
EC (OXON)

Stewardson, B.R. MA (MELB), PH D (CANTAB) *on leave*

Thomas, K.D. BA (ADEL), M EC (CALIF)

### *Lecturers*

Hazari, B.R. BA, MA (DEHLI), MA, PH D (HARV)

Huynh, H.C. B COM (WA) M EC (MON)

Kingma, O.T. B AGR SC, M AGR SC (CANTUA)

Kopcke, R.W. BA (MICH), MA, PH D (HARV)

Langley, P.C. B SC (HULL), MA (OTWA)

O'Brien, G.C. B SC (QLD), M SC (NE), PH D (ANU)

Scorgie, M.E. B COMM (MELB)

Weston, Caryl R. B COMM (MELB), B JURIS, LL B,  
PH D (MON)

### *Visiting Lecturers*

Elsun, D.L. B ENG, B COMM (MELB), M SC (GEORGIA  
INST TECH)

Subocz, V. M COMM (MELB), PH D (LOND), AASA

### *Instructor*

Wiltshire, Zaiga M EC (SYD)

### *Senior Tutor*

Watkins, J.D. B EC (MON)

## LEGAL STUDIES

### *Professor*

Braybrooke, E.K. LL M (NZ), LL M (COLUMBIA)  
Barrister and Solicitor of the Supreme Courts of  
NZ and WA *Chairman*

### *Lecturers*

Douglas, R.N. BA, LL B (MELB), M PHIL (YALE)

\*FitzGerald, J.M. LL B (MELB), LL M, MA, PH D  
(NORTHWESTERN)

### *Senior Tutor*

Petersen, Kerry A. LL B (MELB) Barrister and  
Solicitor of the Supreme Court of Victoria

\*Joint appointment with the Department of  
Sociology.

## POLITICS

### *Professors*

Martin, R.M. MA (NZ), PH D (ANU)  
 Wolfsohn, H.A. BA (MELB), *Chairman*

### *Reader*

Rydon, C. Joan BA, DIP ED (SYD), PH D (MELB)

### *Senior Lecturer*

Glezer, L. BA (MELB) *on leave*

### *Lecturers*

Miller, J. MA (CANTAB)

Camilleri, J. BA (MELB), MA (MON), PH D (LOND)

Chiddick, J.P. BA, B PHIL (OXON), M SC (LOND)

James, M.H. BA (DURHAM)

Plehwe, R. BA, LLB (TAS), PH D (DUKE)

Polis, T. BA (MELB)

Reynolds, R.L. MA (AUCK)

Rubenstein, C.L. MA (MELB)

Schehtman, J. BA (JERUSALEM)

Smith, R.F.I. MA (ADEL), PH D (ANU)

### *Senior Tutors*

Butman, G. B EC (MON)

Filar, Patricia BA (MELB)

Garland, P. BA (MELB)

Henderson, G.J. BA, LL B (MELB)

McCoppin, G. Brigid BA (MELB)

## SOCIOLOGY

### *Professors*

Martin, Jean I. MA (SYD), PH D (ANU)

Veliz, C. B SC (FLORIDA), PH D (LOND), FRHISTS

*Chairman*

### *Reader*

Edgar, D.E. BA, M ED (MELB), PH D (STAN)

### *Senior Lecturers*

Balmer, C.J. BA (TAS), ED D (FLOR)

Cubbon, H.A. MA (CANTAB), PH D (MELB)

Dempsey, K.C. BA (SYD), DIP ED, PH D (NE)

Hickman, D.C. BA, B ED (MELB), PH D (ANU)

Ireland, R.H. BA (MELB), PH D (HARV)

Mulligan, D.G. MA (NZ), PH D (LOND)

Rose, G. MA (OXON), MA (CANTAB)

Schutte, H. DIPL HDL (COLOGNE), DR SC POL (KIEL)

Trahair, R.C.S. BA, PH D (MELB)

### *Lecturers*

Carroll, J.B. BA (MELB), MA, PH D (CANTAB)

\*FitzGerald, J.M. LLB (MELB), LL.M, MA, PH D  
 (NORTHWESTERN)

Inglis, Christine BA (SYD), MA (ANU)

Kilmartin, L.A. BA (QLD)

Kitaoji, H. BA (INTERNATIONAL CHRISTIAN), MA  
 (TEXAS)

	Lauderdale, Sandra M. BA (COLOR), MA (CORN)
	Otto, Rosemarie BA, DIP SOC STUD (MELB)
	Pelz, W. BA (LOND), PH D (BRISTOL)
	Richards, Marilyn G. BA (ADEL), MA (LA TROBE)
	Richmond, Catherine M.G. BA (MELB), MA (ANU)
	Sugimoto, Y. BA (KYOTO), PH D (PITTSBURGH)
	Ternowetsky, G.W. BA (WYNNIPEG), MA (CALGARY)
<i>Research Associate</i>	Coy, P. BA DIP ANTHROP (DURHAM), B LITT D PHIL (OXON)
<i>Senior Tutors</i>	Harper, Janice M. BA (SYD) Harvey, Susan D. BA (WA), DIP SOC STUD (SYD), MA (ANU)
	Taylor, Evelyn J.S. BA (MON)
<i>Tutors</i>	Sgro, Diane BA, DIP ED (LA TROBE)
	*Joint appointment with legal studies.

## SENIOR LIBRARY STAFF

*Chief Librarian* Borchardt, D.H. MA (NZ), DIP NZ LIB SCH, ALA (UK) FLAA

### Readers Services

*Assoc. Librarian* Scrivener, J.E. BA, DIP ED (TAS), ALA (UK), ALAA

*Senior Reference Librarian* Choate, C.R. BA (WYOM), MS IN LS (COLOMBIA)

*Reference Librarian* Hyslop, Margot J. BA (MELB), ALAA

### Selection

*Senior Librarian* Barraclough, H.C. BA (MELB), MA (CALIF), ALAA

### Serials

*Librarian* Longley, Pamela R. BA (TAS), ALAA

### Systems

*Librarian*

### Technical Services

*Assoc. Librarian* Stecher, G. BA (MELB), BLS (MCGILL), ALAA

*Senior Librarian* McKinlay, J.W. BA (TAS), ALAA

*Librarians* Hoffman, Helen K. BA (MELB), ALAA

Horecek, J.I. BA (MELB), MA (LOND), ALAA

## SENIOR ADMINISTRATIVE AND COLLEGE STAFF

<i>Vice-Chancellor</i>	Myers, D.M. B SC, D SC ENG (SYD), FIEE, FIE AUST, F INST P
<i>Registrar</i>	Taylor, Maj.-Gen.T.S. CBE, MVO, MC
<i>Deputy Registrar</i>	Griffith, D.A.C. TD, B SC (ENG) (LOND), AFAIM
<i>Assistant Registrar</i>	
<i>Staff Officer</i>	Tolhurst, N.M. BA (LA TROBE)
<i>Council Executive Officer</i>	Sewell, S.M. BD (LOND), MA (HARTFORD)
<i>Publications and Information Officer</i>	Segrave, R.W. MAIE, AMICIE, MPRIA
<i>Business Manager</i>	Janicke, J.C. BA, DIP ED (MELB)
<i>Deputy Business Manager</i>	Christie, R.C. B EC (CIVIL), B COMM (MELB)
<i>Deputy Business Manager (Physical Planning)</i>	Russell, T.C.C. ARIBA, ARAIA
<i>Accountant</i>	Hooper, J.C.M. FCA

### Chisholm College

<i>Head Bursar</i>	Morrison, Professor J.D. PH D, D SC (GLAS), FAA, FRACI Broderick, Lucille M.
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### Glenn College

<i>President</i>	Oates, S. BA, B ED (MELB), TPTC
<i>Secretary</i>	Bodey, N.H.

### Menzies College

<i>Chairman Manager</i>	Star, J.C.
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### Computer Centre

<i>Manager</i>	Edwards, J.A. BA (KEELE)
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### University Advisory Services

#### Health Service

<i>Physician-in-Charge</i>	Semmens, K. MB, BS (MELB), DTMH (LOND)
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#### Counselling Service

<i>Counsellor</i>	Bailey, C.F. B ECON (SYD), DIP PSYCH (MELB)
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#### Careers and Appointments Service

<i>Adviser</i>	Waterhouse, J.L. B COMM (MELB)
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## INTRODUCTION

La Trobe University, which admitted its first students in March 1967, is the youngest of the three Victorian universities and, at present, the smallest in terms of student enrolments. Its 500-acre site at Bundoora, nine miles north-east of the City of Melbourne, was however selected with a view to its capacity to provide the space necessary for the eventual development of a large institution. To meet the State's urgent need for increased university places it was necessary to plan for a rapid growth in student enrolments in the first few years of the University's existence. From an initial enrolment of 500 in 1967, total enrolments rose to 4,304 in 1972 and are expected to reach approximately 7,000 by 1975.

The University was established when the Parliament of Victoria passed the La Trobe University Act No.7189 of 1964. The provisions of the Act were based principally on recommendations made by a committee appointed by the government in May 1964 under the chairmanship of Mr J.R.A. (now Sir Archibald) Glenn.

The University is named after Charles Joseph La Trobe (1801-1875), who was appointed as first Lieutenant-Governor of the new Colony of Victoria in 1851.

For the first two years responsibility for the planning of the new institution rested with an Interim Council. The first Council of the University took office in December 1966 and elected as Chancellor Sir Archibald Glenn who retained this office until July 1972 when he was succeeded by the Hon. Mr Justice Smithers. The University was formally opened by His Excellency the Governor of Victoria, Major-General Sir Rohan Delacombe, at a ceremony on 8 March 1967 during which Sir Archibald Glenn was installed as Chancellor by the then Premier of Victoria, Sir Henry Bolte.

The Council, which is the governing authority of the University, has 31 members including the Chancellor, the Vice-Chancellor, the deputy chairman of the Academic Board, the President of the Students' Representative Council and the Director General of Education. Of the remaining 26 members, nine are appointed by the Governor in Council, seven are co-opted by Council itself, four are elected by University staff, three are elected by the Academic Board, and three are elected by students. The senior academic body, the Academic Board, has the principal responsibility of making recommendations to Council on all matters of academic policy. These recommendations are framed in the



light of advice which the Board receives from its various standing committees and from the boards of studies of the several Schools, which are the academic units into which the University is divided.

There are at present seven Schools. Of these, four (biological sciences, humanities, physical sciences and social sciences) were established before the University opened in 1967. Since then two professionally oriented Schools have been added – the School of Agriculture in 1968 and the School of Education in 1970.

The department of psychology offered its first courses in 1972 and has now been incorporated into the School of Behavioural Sciences which was established in 1973.

In 1973 enrolments in the seven Schools were as follows:

	Bachelor degree	Higher degree	Diploma in Education	Other	Total
Agriculture	188	18	—	—	206
Biological Sciences	398	37	—	7	442
Education	224	52	374	19	669
Humanities	1629	53	—	23	1705
Physical Sciences	464	86	—	9	559
Social Sciences	1249	76	—	35	1360
Behavioural Sciences	154	13	—	6	173
Total	4306	335	374	99	5114

The University held the first ceremony for the conferring of degrees in December 1969 when 144 graduands received their testamurs from the Chancellor and a further 28 were admitted to degrees *in absentia*. In subsequent years it has been necessary to hold two ceremonies annually for the conferring of degrees and diplomas on increasing numbers of graduands.

The staff of the University has steadily increased since 1967 to meet the needs of the growing body of students. In 1973 there were 347 full time and 191 part-time staff directly engaged in teaching and research.

## DEVELOPMENT

Beginning modestly in 1965 the University's building program up to the end of 1973 has resulted in the completion of approximately 50 per cent of the ultimate development.

Glenn College and the first stage of the Library had to accommodate the initial intake of students in 1967. Since that date facilities have been added to provide permanent homes for five Schools, (Humanities, Social Sciences, Biological Sciences, Physical Sciences and Agriculture) and administration.

Building projects completed in 1973 included the Union building, extensions to Glenn and Menzies colleges, north-west annexe, and four squash courts.

Projects under the 1973-75 triennium program to be completed and occupied early in 1974 are the extensions to Chisholm College, physical sciences IV, biological sciences II, humanities/education complex stage I, extensions to biological sciences I, extensions to the maintenance and services depot, plus a third-stage development of staff and student flats at the Waterdale Road site.

## UNIVERSITY FINANCES

Most of the funds for the capital development of the University are made available by the Commonwealth Government with additional finance being obtained from loans. Capital funds available to the University in the 1973-75 triennium are \$14,670,000.

The University was granted the sum of \$10,310,000 for recurrent expenditure in 1974. This amount is provided by the Commonwealth Government.

While the University receives most of its funds from government grants, it nevertheless welcomes donations, bequests and loans both for general purposes and for such special purposes as the Bursary Fund, the Students' Loan Fund, student housing, research into particular areas, the establishment of fellowships and scholarships and the purchase of major items of equipment.

Gifts, bequests and loans may take the form of money, land, investments, works of art, books or other property. Under existing legislation gifts of funds to the University are allowable income tax deductions, and bequests are not subject to Victorian probate duty or Federal estate duty.

A donor may make a gift or bequest without conditions, leaving the Council of the University to apply it to the best advantage of the University, or the donor may lay down conditions or specify the objects to which the gift or bequest is to be applied. The University will strictly carry out the donor's wishes. In the case of a substantial gift the University will perpetuate the donor's name.

The University will welcome short or long term loans of suitable works of art, books and scientific or other equipment for display or use. The University will insure items lent and will look to their preservation and safety.

Intending benefactors are invited to discuss the terms and conditions with the Vice-Chancellor or the Business Manager to ensure that the gifts are applied to the general or special purposes most suited to the wishes of the benefactor and the needs of the University.

A suitable form of bequest is:

*I give to La Trobe University the sum of .....  
dollars free of all duties to be applied for the purposes of the University  
either in such manner as the Council thereof may determine or in the  
following manner .....  
.....  
and I direct that the receipt of the Business Manager of the University  
shall be a sufficient discharge to my trustee(s) for payment of that sum.*

When the manner of application is precisely specified, it is suggested that the Council be empowered to apply the gift or bequest from time to time in any manner which in the opinion of the Council is similar to or a satisfactory substitute for the specified manner.

## **LIBRARY**

The collections and services of the library are being developed to support the teaching and research programs of the University. During the early stage in its growth emphasis has been placed on the provision of books and periodicals directly relating to the subjects being taught. In 1974 the holdings will be approximately 197,000 volumes of books and periodicals and some 20,000 volumes will be added during the year.

The library building, which is located on the northern side of the agora in the centre of the academic buildings, is designed to house up to 240,000 volumes and 1,800 readers. The main entry to the building is from the

concourse on the second level, and on this floor most service functions are located – the public catalogues, the reference collection and reference service point, the loans desk, the reserve book collection, the microform collection and reading equipment, and offices and workrooms for the library staff. Level three houses the general collection and the main reading area, including 32 lockable carrells for the use of research students. Level one houses the serials collection with its associated display and reading areas, the serials and government documents workroom, the research collection (which includes government documents) and its reading area, and the special collections room.

A fuller description of the library and of the services it offers to students is contained in the *Library Guide*. The rules governing use of the library are set out in the University's Regulation 20.2(1) *Use of the Library*. All students should provide themselves with the Guide and the regulations, copies of which may be had from the loans desk.

The librarians of the reference section give individual assistance to students when requested and in co-operation with the Schools give courses of instruction in library use and subject bibliography.

## **THE COLLEGES**

The three colleges of the University each provide a number of study bedrooms for residential students. Glenn College, which has been in operation since the opening of the University in 1967, and Menzies College which opened the following year, also provide common dining, social and recreational facilities. In Chisholm College, which opened in 1972, study bedrooms are arranged in groups of 8 to 12, each group having its own kitchen and dining area where residents may prepare and eat their meals. No central catering is provided in this college and the residence fee covers the cost of room only.

### **Application for College Residence**

In addition to the application to enrol at the University, a separate application is required for residential accommodation in either Glenn College, Menzies College or Chisholm College. Further information and application forms may be obtained by writing to:

The Student Accommodation Office,  
La Trobe University,  
Bundoora, Victoria 3083.

## UNIVERSITY HEALTH SERVICE

<i>Physician-in-charge:</i>	Dr K. Semmens
<i>Physician:</i>	Dr R. Hall
<i>Nursing Sister:</i>	Miss Nina Sedlmayr
<i>Secretary/Receptionist:</i>	Mrs Sheila Harris

The University Health Service is located on level one of the north-east annexe to the south building.

For students and staff the University Health Service provides the opportunity to discuss medical problems, vaccination before overseas travel, insurance medical examinations, and first-aid care in case of accident or medical emergency on campus. Treatment for illness may be provided, or the patient may be referred to a more appropriate place for further care. Immunization against tetanus, poliomyelitis, etc., is available.

Sports injuries may be treated initially in the sports pavilion by honorary *sports medicine physicians* but subsequent treatment is obtained either from private physicians or from the Health Service. An orthopaedic surgeon may be consulted in an honorary capacity during his weekly visit to the Health Service. Physiotherapists attend daily, their charges being reimbursed by the Sports Union insurance company.

For students, the University Health Service hopes to be of use particularly where ill-health or worry is interfering with studies, and where the stresses of undergraduate life are having an effect on a student's health.

The Health Service is open during normal University hours. No charges are made. Consultation by appointment. Minor conditions may be seen without appointment in casualty department between 9.30 am and 12.30 pm, and 2.30 pm and 5 pm.

## UNIVERSITY COUNSELLING SERVICE

<i>Counsellors:</i>	Mr C.F. Bailey, Mr Terry O'Neill
<i>Secretary:</i>	Miss Jennifer Williamson

The function of the Counselling Service is to offer help, either individually or in groups, to students who are having such difficulties as defining their vocational goals, settling down to effective study, adjusting to life at university, or dealing with their personal problems.

The service is available with (but in an emergency without) an appointment to any member of the University and to those who are interested in becoming students. Appointments can be made in person or by telephon-

ing extension 2957 or 2958. The counselling unit is located with the other advisory services on the ground floor of the north-east annex of the south building between the humanities building and the south building.

## **CAREERS AND APPOINTMENTS**

*Adviser:* Mr John Waterhouse  
*Assistant to Adviser:* Mr Dan Octigan  
*Secretary:* Mrs Gail Birchall

The Careers and Appointments Advisory Service helps an undergraduate to clarify and achieve his vocational goals. The service offers advice and information to enable the student to be realistically aware of the facts and problems of career opportunities, thus equipping him to accept responsibility for his own future. It assists those seeking graduate employment, and may be of help to students who are looking for vacation work, or part-time work during the academic year, or positions in which they can make the best use of a partially completed degree course. Advice about careers open to graduates may also be of use to those who are involved in choosing between possible university courses or still completing their final year at school.

## **STUDENT HOUSING SERVICE**

*Student Housing Officer:* Mrs Betty Collings  
*Secretary:* Mrs Carmen Axisa

The Student Housing Service is provided to assist students in finding accommodation other than in colleges, and to advise on any relevant problems such as types available, costs, suitable areas, transport, etc.

Offers of accommodation for students are visited wherever possible to ensure reasonable domestic and study facilities, and a permanent listing of available places is kept throughout the year. These vary from furnished rooms (from \$9 a week) to private board (from \$16 a week), or varying arrangements between the two, to suit a particular student's needs.

There is also a limited number of University flats available to students. These are mostly two-bedroom, furnished flats. General information about other flats and houses for rental in the area is provided.

Country students should allow sufficient time to locate suitable places (possibly an overnight stay in Melbourne) and private transport is invaluable when doing so.

Enquiries should be directed to the Student Accommodation Office, La Trobe University, Bundoora, 3083. Telephone 478 3122.

## STUDENT LOANS

The resources of the students' loan fund are limited. The students' loan fund committee expects that, in 1974, it will be able to assist only those students whose financial difficulties are considerable and who require loans to enable them to pay general service fees, purchase prescribed books and equipment and provide essential living expenses including child care support. Preference is given to later-year students to enable them to complete their degree. A loan cannot be made to assist a student with the purchase or repair of a motor vehicle. It is the committee's policy that a loan should supplement other income and not serve as a student's primary source of funds.

The committee has a policy under which it will advance no more than \$550 to a student during one academic year with a maximum of not more than \$1,100 during a course. In 1974, because of the limitation on funds it may not be possible to lend the full amount of \$550 unless there are very special circumstances. When approving a loan application the committee specifies the period within which the loan must be repaid. In setting this period the committee takes account of a student's overall financial position and the amount of the loan. Long-term loans must be repaid within two years of the completion of a course or withdrawal from the University. Shorter periods apply to other types of loan (emergency, short-term, medium-term). The amount of interest charged on a student loan varies according to the repayment period set. An applicant must nominate a guarantor for a medium or long-term loan.

The committee may recommend to the Bank of New South Wales that it grant a supplementary loan of up to \$300 on the basis of \$2 for \$1 from the fund. Interest is charged on the bank loan at a concessional rate.

A list of persons who may approve short-term (up to \$50, repaid within two months) and emergency (up to \$10, repaid within two weeks) loans is displayed on the official noticeboard.

Enquiries regarding all types of student loans should be directed to the secretary of the students' loan fund committee, Registrar's Department.

## COMPUTER CENTRE

*Manager:* John Edwards

*Secretary:* Diana Sanci

The university Computer Centre which is situated in the north-west annexe of the south building is equipped with a DEC-System 10 computer. This is a versatile machine which provides simultaneously multi-program batch processing, real-time capabilities, and sophisticated timesharing for up to 40 remote users. A KI10 processor with 131,000 words of memory combine with disc, drum and magnetic tape peripherals to make this machine currently the most powerful DEC computer in Australia.

As well as providing services for the administrative, research and teaching functions of the university, the Computer Centre has a major interest in interactive graphics and a PDP15 with a VT15 graphics system forms an important part of the computer network. Computer applications in the library sphere are at present being studied, and eventually many library services will be on-line to the main computer through a PDP-11.

Card punch facilities are available to cater for the requirements of batch-oriented jobs.

Service courses in programming are conducted by the centre for academic departments. Additional courses for staff and students can be arranged by contacting the secretary of the Computer Centre.

## SHOPPING AT LA TROBE

A central feature of the campus is a shopping/recreational centre known as the Agora. The Agora is administered by the University's commercial management committee, to which members are appointed from various sections of the University community, including students.

The following facilities are provided in the Agora at present:

- |                                    |  |
|------------------------------------|--|
| Books, records, prints, stationery | — La Trobe University Bookshop                             |
| Savings and trading banks          | — The Bank of New South Wales                              |
| facilities                         | — The State Savings Bank of<br>Victoria                    |
| Saving and borrowing facilities    | — La Trobe University Staff Credit<br>Co-operative Limited |
| Travel arrangements                | — AUS Travel Service                                       |



Food, drinks, light refreshments	– The Union Coffee Shop
	– Qol Whole Foods Pty Ltd
	– Mrs Nemec's Delicatessen and Grocery
Clothing	– Mr S. Bruce
Barristers and Solicitors	– Messrs Peter McGrath and Julius Colman
Pharmaceutical Supplies	– Milne's Pharmacy
Hairdresser, tobacconist	– Renato of Venice
Drycleaning/Post Office	– Heidelberg Dry Cleaners Pty Ltd
Leathergoods, handcrafts etc	– Mr J. Connor

The committee is responsible for the regulation of commercial activities on campus. Its secretariat is provided by the Business Manager's department.

## THE LA TROBE UNIVERSITY BOOKSHOP

The La Trobe University bookshop is owned by the University. The shop, located on the eastern side of the agora, is the largest in the northern suburbs and one of the best in Melbourne.

The bookshop stocks all text books prescribed or recommended for study in the many courses offered at La Trobe, as well as a liberal range of general reading involving an extensive range of fiction and of reference works. There is a choice of children's books and a special and up-to-date section for current and topical releases. A variety of stationery, pens, records and magazines is also available.

The bookshop has a carefully controlled credit system for those who wish to pay for their purchases on a monthly basis. A special order service and a reservation service are also offered. The former enables a customer to order types of books not normally held in stock; the latter allows customers to reserve books that are already on order. When they arrive a copy is put aside and the customer notified that the books can be collected.

The bookshop is controlled by a board of management representing various interests within the University. The board comprises five students appointed by the Students' Representative Council, and one representative of the academic staff, the Business Manager's Department and the Library.

The bookshop manager is a member of the board, and there is a professional outside consultant. At present, the chairman of the board is a student.

Any enquiries about the bookshop should, in the first instance, be directed to the manager.

## CHILDREN'S CENTRE

La Trobe University Children's Centre accepts children in the age range six weeks to five years for all day or part day care. There are 35 places for children under three and 25 places in the kindergarten for children over three. The kindergarten has two sessions per day but children can be left for the full day.

The demand for places is high and bookings should be made as soon as possible. All enquiries should be made to the Directress, Mrs Shaw, telephone 467 3819.

In 1973 fees were as follows:

	Hour	Day	Week
Under 3	60c	3.50	16.00
Over 3	Morning and afternoon sessions \$5.00		14.00

## SPORTS UNION

The La Trobe University Sports Union was established in 1967 to assist and co-ordinate the establishment and administration of the various sporting clubs. The Sports Union Council consists of a delegate from each club. The Sports Union executive committee, elected from Sports Union Council members, administers, through the executive secretary, the Sports Union. Its offices are located in the Union building.

Facilities are available for recreational and competitive sporting activities. A sports pavilion and playing fields, tennis courts and north-east of Glenn College, an indoor sports centre have been established. Six squash courts are available and an indoor field house, 80 feet by 100 feet is suitable for a wide range of activities. The indoor sports centre is open from 8 am to 12 midnight on week days, 9 am to 6 pm on Saturdays and 10 am to 6 pm on Sundays.

Recreational classes in a variety of activities are available and enquiries should be made to the recreation officer.

A wide variety of sporting clubs are functioning and the following are available to members of the Sports Union: aikido, athletics, Australian rules football, badminton, baseball, basketball (mens international rules), basketball (womens international rules), boxing, canoeing, cricket, equestrian, fencing, golf, hockey (mens), hockey (womens), judo, karate, lacrosse, lawn tennis, mountaineering, netball, rowing, rugby, skiing, sky-diving, soccer, softball, squash, sub-aqua surf-riding, swimming, table tennis, tae kwon do, volleyball, weightlifting and yachting. Clubs enter teams in inter-~~varsity~~, intra-~~varsity~~ and local competitions. The Sports Union also provides recreational sessions for those wishing to take part in a variety of activities on a 'drop-in-and-have-a-go' basis.

## **STUDENTS' REPRESENTATIVE COUNCIL**

The SRC consists of 19 members elected by and from all students (full-time, part-time, postgraduate and undergraduate) and exists to 'represent the students of the University on all matters affecting their interests'. The staff consists of an administrative secretary/accountant, a stenographer and a typist. Offices are situated in the Union Building.

A general election is held annually within the first four weeks of second term. Of the 19 SRC elected members, 12 are elected by the SRC to hold portfolios. They are: president, honorary secretary, treasurer, publications committee chairman, activities committee chairman, facilities planning and management committee chairman, clubs and societies committee chairman, constitutional and legal affairs committee chairman, housing and advisory services committee chairman, AUS committee chairman, public affairs committee chairman and academic affairs committee chairman.

The SRC promotes the social, cultural and intellectual life of the University through such activities as balls, forums and guest speakers, by the organization of orientation, by supporting more than 50 clubs and societies, and by publishing a magazine and a bi-weekly newspaper.

The SRC is affiliated with the Australian Union of Students.

The SRC is available to all students and it is hoped first-year students particularly will acquaint themselves with the SRC. Any ideas or interests are welcomed.

### **Clubs and Societies**

A University course includes more than academic study and the following clubs and societies are registered with the SRC. Membership is open to all students.

Agape, agriculture students, alternate education group, alternate social sciences, anarchists, anti-foreign bases action committee, apathy league, arts co-op, Asian students' association, association for the international exchange of students in economics and commerce, association of La Trobe tobacco chewers and body painters, association of sociology scholars, ballroom dancing, chess club, China society, christian union, commune, communist club, conservation society, contemporary dance group, democratic club, draft resisters' union, ecological society, film production group, folk club, four wheel drive, French-arts group, geological society, Hellenic club, historical association, Italian club, labour club, liberal club, literary society, marijuana action group, Mataungan film makers, moat theatre, moderate student alliance, motorcycle association, music society, Papua/New Guinea society, philosophy society, photographic club, physics society, prisoners action group, pro-life club, progressive experimental student theatre, progressive film group, psychological society, radical student movement, road trauma group, social involvement, social responsibility in science, strawberry, vegetarian society, womens' liberation, yoga.

## Rabelais

The student newspaper of La Trobe University, *Rabelais*, is designed to provide news, information on campus activities and articles of general interest. It is edited and staffed by students and financed by the SRC and advertising. Fifteen editions are published throughout the year, plus a special election edition of photographs and policy speeches of students standing for election to the SRC.

The editor is elected at the end of each academic year and assumes his position the following academic year.

## THE UNION

The term *Union* goes back to Cambridge and Oxford where groups of students united to form debating clubs or debating unions. Facilities such as lounges, coffee rooms, toilets naturally were necessary. Modern Unions are designed as social, cultural and recreational centres within the University.

La Trobe University Union is open for membership by students and staff. Membership is also open to those who have been members of the University for at least one year.

The Union provides catering services in the dining room and snack bar in the Union building and in the Union coffee shop located in the Agora.

Assistance is also given with special functions.

Other facilities provided by the Union include games, a browsing library, music listening facilities, billiards, table tennis, television, meeting rooms, private dining rooms and lounges. Full facilities exist for showering and changing, including hair dryers and electric shavers.

The Union also has a varied program of activities and entertainment. Negotiations are continuing for a liquor licence and planning has begun for extensions of the present building.

The Union board is responsible for Union policy. The president and eight board members are elected by the members at the end of first term each year. University Council appoints two members to the board.

The Union enquiries desk (next to the dining room) gives referrals and information on a wide range of University and outside services. Any personal enquiries about the Union should be made here. Correspondence should be addressed to the secretary/manager, Mr Arthur Hayes.

## COMMONWEALTH TERTIARY ALLOWANCES SCHEME

To complement its decision to abolish university tuition fees, the Commonwealth Department of Education will introduce in 1974 the Tertiary Allowances Scheme, which will provide means-tested living and other allowances to all full-time non-bonded Australian students admitted to or continuing approved university courses.

### ELIGIBILITY

Open to all *full-time* students whose parents are permanent residents of Australia or who are themselves permanent residents of bona fide migrants and, who, in addition

1. are entering an approved university course to commence a first degree, or
2. have completed one part-time or external year of a course, irrespective to their previous results, or
3. have completed one full-time year or more (or its part time equivalent) of an approved course provided they have passed 50% or more of their subjects in the last year in which study was undertaken., or
4. have attempted all years of their course, but still require one or more years in which to complete it, providing they are attempting at least 75 per cent of the normal work for that year.

Benefits normally will be limited to the minimum number of years of any approved course. Students transferring to another course will be

ineligible for benefits until attaining a similar state in the new course.

Students who have completed a first degree or who plan to undertake a special course may be eligible under certain circumstances.

Approved university courses include undergraduate and postgraduate bachelor's degree, postgraduate diplomas, combined bachelor's degree courses, and master's qualifying courses.

## **BENEFITS**

### **1. Means tested living allowance**

Allowances will be paid on a graduated scale, the maximum allowance being \$850 a year for students living at home and \$1400 a year for students living away from home under approved circumstances.

The maximum allowance is payable where the family's adjusted income is \$5300 a year or less and some allowance is payable on a reducing scale for family incomes above \$5300. For married and qualified, single independent students, the means test is applied to the student's income, and, where applicable, the spouse's income.

### **2. Incidentals allowance**

All students qualifying for a living allowance will receive \$100 to cover the general service fee, books and equipment.

### **3. Dependents' allowance**

A married student qualifying for a living allowance may receive an allowance of \$8 a week for a dependent spouse and \$5 a week for each dependent child.

### **4. Travel allowance**

Students, qualifying for a living allowance, who are living away from their normal places of residence in order to undertake their courses of study, may be reimbursed the costs of three return trips a year between their homes and the University.

## **APPLICATIONS**

Application forms and information booklets will be available in mid-October and the closing date is 31 October 1973 or as soon as possible thereafter. Forms may be obtained from all secondary, technical and tertiary institutions and from the Department of Education.

Current Commonwealth Scholarship holders will receive information regarding the transfer of their scholarships to the new scheme directly from the Department of Education.

Further information may be obtained from the Regional Director, Department of Education, 450 St Kilda Road, Melbourne, Vic. 3004.

## LA TROBE UNIVERSITY RESEARCH SCHOLARSHIPS

A number of research scholarships will be awarded in 1974, tenable at La Trobe University.

### Eligibility

Applicants are expected to have graduated with first-class or upper second-class honours, or equivalent qualifications, from a recognized university. Final-year students are eligible to apply. An applicant who already holds the degree of Ph D, conferred either in Australia or elsewhere, will not be granted a scholarship.

### Research

The purpose of the scholarship is to assist scholars to carry out under supervision, a program of full-time advanced study and research, in a field approved by the University, leading to one of the following higher degrees: Master of Agricultural Science, Master of Arts, Master of Economics, Master of Education, Master of Science or Doctor of Philosophy.

In allocating scholarships, account will be taken of the suitability of the proposed research project in terms of the supervision and facilities available in the particular discipline.

### Tenure

Scholarships are tenable as follows:

Masters candidates — up to a maximum period of two years.

Ph D candidates:

- (i) Normally up to a maximum period of three years. (Only when exceptional academic circumstances have arisen is it possible to extend a scholarship beyond three years. Such extension will be for the period necessitated by the circumstances of the particular case and will not exceed 6 months.)
- (ii) If a Master's degree candidate is granted approval to upgrade his candidature to Ph D, his award may be extended to three years.

The scholarship is tenable in the first instance from the date of beginning work at the University (usually 1 March) until 31 December of the same year, but is renewable on 1 January each year, subject to satisfactory progress up to the maximum period shown above.

The scholarship may be terminated at any time by the research committee should the scholarship holder fail to pursue a program of full-time study and research.

## **Stipend**

Stipends for scholarships will be paid at the rate of \$2,500 a year. Stipends are exempt from income tax. (The stipend and allowances are currently under review).

## **Other Allowances**

The following special allowances may be claimed:

- (i) Married scholar with dependent wife and one child, \$500 a year;
- (ii) For each additional child to a total of three in all, \$100 a year;
- (iii) In special circumstances consideration may be given by the University to granting assistance to married scholars without children, up to \$300 a year;
- (iv) The University may give consideration to the granting of assistance in special cases other than those specified above, e.g. for a married woman scholar with a child and dependent husband;
- (v) Exemption from compulsory University fees;
- (vi) Thesis allowance, up to \$100.

(Where two theses are submitted, Master followed by Ph D, two claims may be made but the total will not exceed \$100.)

## **Additional University Work**

Scholars will be regarded as full-time research students, but may be allowed to undertake teaching duties provided that such duties do not interfere with a scholar's study program. Generally such duties may not exceed six hours a week or 180 hours in a calendar year (this includes the time required for preparation and marking).

## **Applications**

Applications for a La Trobe University Research Scholarship should be made on the appropriate application forms available from the University.

Completed applications forms should be lodged with the Graduate Studies Officer not later than 31 October.



# **COMMONWEALTH POSTGRADUATE AWARDS**

## **Research Awards**

Each year the Australian Government makes available a number of postgraduate awards which are allocated amongst the universities by the Department of Education.

Applicants must have permanent resident status in Australia.

Applicants should be under 35 years of age and should have graduated or expect to graduate with at least upper division second-class honours in their bachelor degree courses or possess equivalent qualifications.

The maximum tenure of awards is two years for students proceeding to a Master's degree and three years for students proceeding to a doctorate.

The stipend is \$3,050 a year, plus a dependants' allowance of \$676 a year (for wife and one child) and \$260 for each additional child.

In addition to the stipend, travelling, settling in and thesis allowance will be paid.

Applications for a Commonwealth Postgraduate Research Award should be made on the appropriate application form available from the University. Applications should be lodged with the Graduate Studies Officer not later than 31 October.

## **Course Awards**

Special awards are offered by the Australian Government for students wishing to undertake full-time postgraduate study leading to a Master's degree by course work.

Applicants must have permanent resident status in Australia.

Applicants must be under 45 years of age and should have an undergraduate record at better than pass level. In general applicants should not have a break in their studies of more than ten years from the year of graduation.

Scholarship benefits are continued for the duration of the scholar's course, subject to satisfactory progress. Scholars are expected to complete their courses in the minimum time.

The stipend and allowances are the same as for Commonwealth Postgraduate Research Awards.

Applications for a Commonwealth Postgraduate Course Award should be made on the appropriate form available from the University.

Applications close with the Graduate Studies Officer on 30 September.

## EDUCATION DEPARTMENT STUDENTSHIPS

Education Department studentships are available for approved courses for a degree and Diploma in Education. They are available to students in all Schools at La Trobe University and are awarded to be taken up at the beginning of any year of the course. They are for full-time study only and are for the minimum period required to complete the course.

The studentship may be extended to include the fourth year of an honours degree.

### Benefits

The award pays tuition fees and an allowance of \$1,549 a year for first-year students, rising to \$2,021 in the fourth year, with \$100 additional for those living away from home. For undergraduate and graduate entrants the allowances are:

Completed first year:	\$1,976 – \$2,434
Completed second year:	\$2,746 – \$2,933
Completed degree:	\$3,515    \$4,160

There are separate rates for those with dependants.

In addition, the award constitutes appointment into the State teaching service with an assured position as a permanent teacher after qualifying for the Diploma in Education.

A student who accepts a studentship is required to enter into an agreement which requires service with the Education Department for three years after completing the course, or one year in the case of graduate awards.

Further information is available from The Principal, Teachers' College, La Trobe University or from the Recruitment Officer, Education Department, 480 Collins Street, Melbourne (telephone: 62 0711 extn 363).

## PUBLIC TRANSPORT

Copies of bus timetables and fare concession application forms are available at the Student Administration Branch. Buses leave the campus from the south building. For information on tram, train and bus services in the metropolitan area, ring the transport information centre on 63 0141. For services in the country, ring 63 0202.

### Bus Routes to the University

(\*Indicates a connection with the rail and tram routes mentioned below):

#### Melbourne and Metropolitan Tramways Board route:

City – Russell Street (terminus at Bourke Street), Rathdowne Street (Exhibition Buildings), North Carlton, North Fitzroy, Clifton Hill, Dennis\*, Northcote, Fairfield, Ivanhoe, West Heidelberg, La Trobe University;

#### Ivanhoe Bus Company route:

Deepdene (Burke Road tram terminus), Ivanhoe railway station\*, Heidelberg Repatriation Hospital, West Heidelberg, La Trobe University.

#### Dyson's Bus Service routes:

- (i) Regent railway station\* or Northland, East Preston tram terminus\*, La Trobe University, Janefield.
- (ii) Regent railway station\* or Northland, East Preston tram terminus\*, La Trobe University, Greensborough railway station\*.
- (iii) Regent railway station\* or Northland, East Preston tram terminus\*, La Trobe University, Watsonia railway station\*, North Watsonia.

The majority of Dyson's services do not enter the campus.

#### Mees' Bus Lines route:

East Rosanna (corner of Graham and Warren roads), Macleod railway station\*, La Trobe University.

### Rail

1. Princes Bridge to Heidelberg and Hurstbridge railway line. Bus services depart from Ivanhoe, Macleod, Watsonia and Greensborough railway stations for La Trobe University.
2. Princes Bridge to Reservoir and Epping railway line. Buses link Regent railway station with La Trobe University.

### Tram

Bourke Street to East Preston tram line. Buses link the East Preston tram terminus with La Trobe University.

## UNDERGRADUATES — ADMISSION TO A COURSE

### Entrance Requirements

A prospective student must satisfy, or be exempted from, the university entrance requirements specified by the Victorian Universities and Schools Examinations Board.

In exceptional circumstances consideration may be given to a person seeking entry to the University who has not passed the English expression paper in the higher school certificate examination but has obtained meritorious results in other subjects (including any prerequisite subjects specified for a School) in that examination. Enquiries should be directed to the Admissions Officer. (extn 2738).

The current edition of the Board's handbook is available from the Secretary, Victorian Universities and Schools Examinations Board, 437 St Kilda Road, Melbourne, 3004.

In addition to the requirements specified in the handbook a prospective student seeking admission on the basis of the *mature age* provisions (that is not less than 25 years of age) must have passed English expression at the Victorian higher school certificate examination or a special test in English and two subjects at the Victorian higher school certificate examination in accordance with the requirements specified for admission to the particular school. Although the Schools of Social Sciences and Humanities do not have course prerequisites, it is suggested that an intending student choose higher school certificate subjects appropriate to those disciplines in which enrolment is sought.

### Course Prerequisites — 1974

Prerequisite subjects must be at grade D or higher at the Victorian higher school certificate examination or an acceptable equivalent unless otherwise stated. There is no minimum age requirement at La Trobe. **Agriculture:** Chemistry and either physics or a branch of mathematics. Exceptions may be made in special cases. Diplomates from Dookie and Longerenong agricultural colleges or Burnley Horticultural College will be considered for selection but should seek an interview with the Dean or an adviser of studies before applying.

**Behavioural Sciences:** There are no special course prerequisites for the Bachelor of Arts degree. Prerequisites for the Bachelor of Science degree are chemistry and at least one subject out of: physics, biology and any mathematics subject.

**Biological Sciences:** Chemistry and at least one subject out of: physics, biology and any mathematics subject.

**Education:** Students are not admitted to first year. A student may enrol for education subjects either after completion of the first academic year in another school of the university or after the completion of a degree.

**Humanities:** There are no special course prerequisites.

**Physical Sciences:** *Either* two out of chemistry, physics, pure mathematics and applied mathematics; *or* general mathematics and either chemistry or physics. Exceptions might be made for students who obtain very high marks in the examination as a whole.

**Social Sciences:** There are no special course prerequisites.

### **How to Apply**

Application forms (form A) have been distributed to all Victorian secondary schools presenting candidates for the higher school certificate examinations.

A prospective student who is not attending a Victorian secondary school may obtain the appropriate form (form B) from the Secretary, Victorian Universities Admissions Committee, 450 St Kilda Road, Melbourne 3004.

All applications close on 12 November 1973.

### **Admissions Advice**

An applicant who seeks advice should contact in the first instance the Admissions Office (telephone 478 3122, extension 2738).

### **Acceptance of an Offer**

Acceptance of an offer must be made promptly. When accepting the offer, a student is required to:

- (a) discuss the proposed course with an adviser of studies,
- (b) complete the registration forms prescribed for that year,
- (c) pay the annual general service fee prescribed,
- (d) have a photograph taken for a student card.

### **Complementary Course Enrolments**

Where a student is allowed to take a subject at the University of Melbourne or Monash University concurrently with his enrolment at La Trobe University, this is known as a complementary course enrolment.

A student enrolling for complementary courses will normally be required to pay the annual general service fee appropriate to La Trobe University and will be exempt from payment of any fees at the other university.

Enquiries should be directed to the Student Administration branch (extn 2004).

## UNDERGRADUATES — CONTINUING ENROLMENT

A student who wishes to continue in 1974 a course commenced in any School except Agriculture must seek an interview with an adviser of studies. Details of arrangements for interviews will be posted on the official notice board during October and sent to each student enrolled in 1973.

Completion of the enrolment procedure requires:

- (a) submission of the prescribed forms through the office of an adviser of studies,
- (b) payment of the annual general service fee by the end of the first week of term,
- (c) notification of a residential address for official correspondence by the end of the first week of term,
- (d) presentation of the student card to the Student Administration branch for updating.

An application for enrolment may be rejected if there are any outstanding debts, including fees, from the previous year of enrolment.

### Withdrawal of Enrolment

A student may apply to withdraw an enrolment by completing a 'withdrawal of enrolment — 1974' form which is available from the advisers of studies or the Student Administration branch.

A withdrawal is not effective until the end of the week in which the form, together with the student card, is received at the Student Administration branch.

A withdrawal will be recorded as a failure at the discretion of the chairman of examiners for that subject *if the department concerned has already offered the major part* (normally two thirds) of the content of the subject. A student may submit reasons in support of a request that a withdrawal in a subject be not counted as a failure.

## POSTGRADUATES

### Admission to a Course

Details of the application procedure and the appropriate forms are available from the Graduate Studies office.

An applicant who is accepted as a candidate will be advised of the registration procedure in the letter notifying the approval and terms of candidature.

## **Continuing Enrolment**

A student who is expected to continue a candidature in 1974 will be sent enrolment papers, by post, in December of 1973.

## **RESIDENTIAL ADDRESS FOR OFFICIAL CORRESPONDENCE**

The University requires a current residential address for official correspondence. An address such as C/- PO Box is not acceptable; a non-resident student may not specify a college address or C/- a University department.

A change of this address must be submitted to the Student Administration branch on a 'change of address' form. A student must also submit his student card at this time so that the address on the jacket may be altered.

## **STUDENT CARD**

Each student will be issued with a student card. The card is issued during the first year of enrolment and updated for each year that student enrolls at the University.

It is part of the registration procedure for a photograph to be taken during the first year; the student card is a photographic by-product of this process. Failure to present this card, when requested, may cause inconvenience to the student concerned.

The card must be returned to the Student Administration branch for amendment if a student changes his address. If the card is lost, the loss should be reported to the Student Administration branch without delay. A new card may be obtained at a fee of \$1. A damaged jacket will normally be replaced free of charge.

Without a current student card a student may not be permitted to use the University library or the Union.

## **OFFICIAL NOTICE BOARD**

The official notice board is located on the second level of the South Building; it is in two sections outside the Student Administration branch.

Students are advised to inspect the official notice board at least once every week of each term.

Annual examination results (pass grades only) are posted on the official notice board.

## FEES

Tuition fees will not be payable in 1974; a general service fee \$83.50 (full-time), \$62.50 (part-time) relating to Union, SRC and Sports Union will be payable. These charges must be paid on enrolment by a new student who must also pay a Union joining fee of \$10, and by the end of the first week of first term by any other student.

## Refund of Fees

A student enrolled in the University for the first time who withdraws before the end of the fourth week of *first* term may receive a refund of the fees paid. A refund will not be made until the student card has been returned.

## EXAMINATIONS

A student may present for the annual examination in any subject for which he has maintained an effective enrolment – i.e. registered, paid all fees – and where his progress during the year has been considered satisfactory.

A provisional examination timetable is published towards the end of second term to enable possible examination session clashes to be checked. The final examination timetable is available for collection from the Student Administration branch towards the end of September.

A student who considers that his performance in examinations has been or will be impaired by illness or other causes may seek special consideration by submitting the appropriate application together with appropriate medical evidence and other supporting statements. The forms are available from the Student Administration branch.

The pass grades adopted by the University for the final assessment of each undergraduate pass or honours subject are:

A	–	80 to 100
B	–	70 to 79
C	–	60 to 69
D	–	50 to 59
P	–	Ungraded pass
NC	–	Pass conceded

In certain cases, an aegrotat pass may be awarded. This is indicated by an asterisk immediately following the grade – eg. D\*. Other grades are detailed on the memorandum of results.



Annual examination results (pass grades only) are posted on the official notice board.

The final assessment of honours-year work may be one of:

- H1 — First-class honours
- 2A — Second-class honours, division A
- 2B — Second-class honours, division B
- H3 — Third-class honours

## **CLASS TIMETABLES**

A timetable for lectures and laboratory periods is produced towards the end of the preceding year. A continuing student should obtain a copy of the timetable from Student Administration before attending a re-enrolment interview with an adviser of studies. Amendments to the timetable are posted on the official notice board. Revised editions of the timetable are generally produced for second and third terms.

## **VARIATION OF 1974 COURSE**

An accepted enrolment may be varied by the deletion of a subject (or subjects) and the inclusion of another subject or subjects, alteration of a course or a transfer from one School to another. A student may request permission to vary his enrolment up to the end of the fourth week of first term. To do so he must complete a 'variation of a course — 1974' form. Copies of this form will be available from an adviser of studies. The completed form must be returned to an adviser of studies.

## ARMORIAL BEARINGS



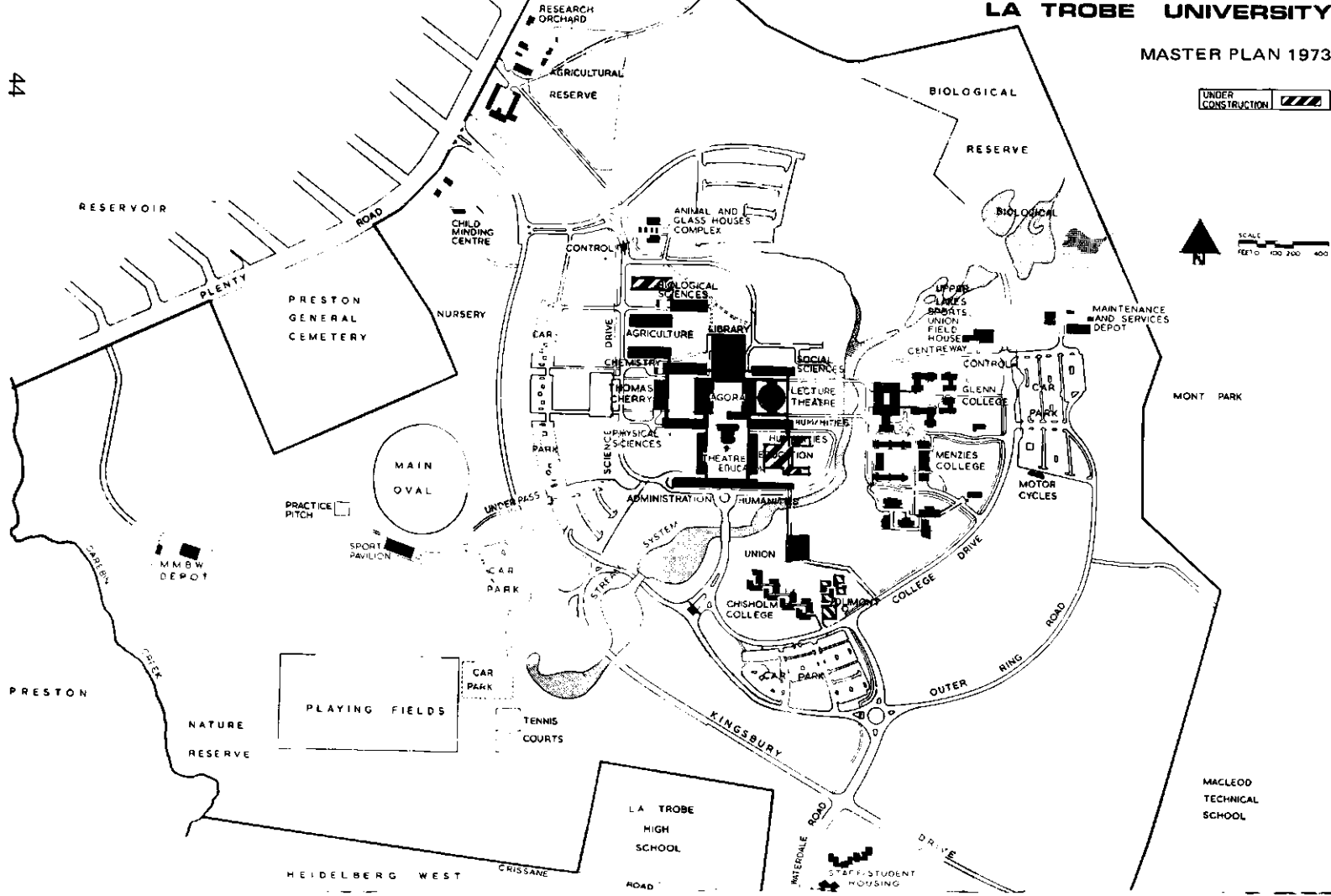
The official description of the University's armorial bearings is "For the Arms, Argent, a chaplet of common heath proper tied azure and circling in chief a Book expanded also proper leathered Gules, over all on a fesse of the last three Escallops Silver, and for the Crest on a Wreath Argent and Gules a Parchment Scroll perched thereon an Australian Wedgetailed Eagle, wings addorsed and inverted proper, the dexter claw supporting an Escallop of the Arms. The Mantling is Gules doubled Argent and the Motto – 'Qui cherche trouve' ”.

Australia is represented by the wedge-tailed eagle and Victoria by the sprigs of heath, the State's floral emblem. The open book symbolises learning and the scallop shells, which symbolise pilgrimages, are a reference to the armorial bearings of the La Trobe family.

The French motto "Qui cherche trouve" (He who seeks will find) is a modern version of the La Trobe family motto.

*finds* / *trouviera*

UNDER  
CONSTRUCTION





Greenwood  
Drive

Larundel  
Psychiatric  
Hospital

Mont  
Park

## Dunne Street

**La Trobe University**

Plenty Road C

Kingsbury

~~Drive~~

to Macleod Stn.

Dougharty Road

**Outthwaite Road**

## Southern Road

Northland  
Shopping  
Centre

## Murray Road

**Albert Street**

## Bell Street

**Oriel Road**

Waterdale Road

**Waiaora Road**

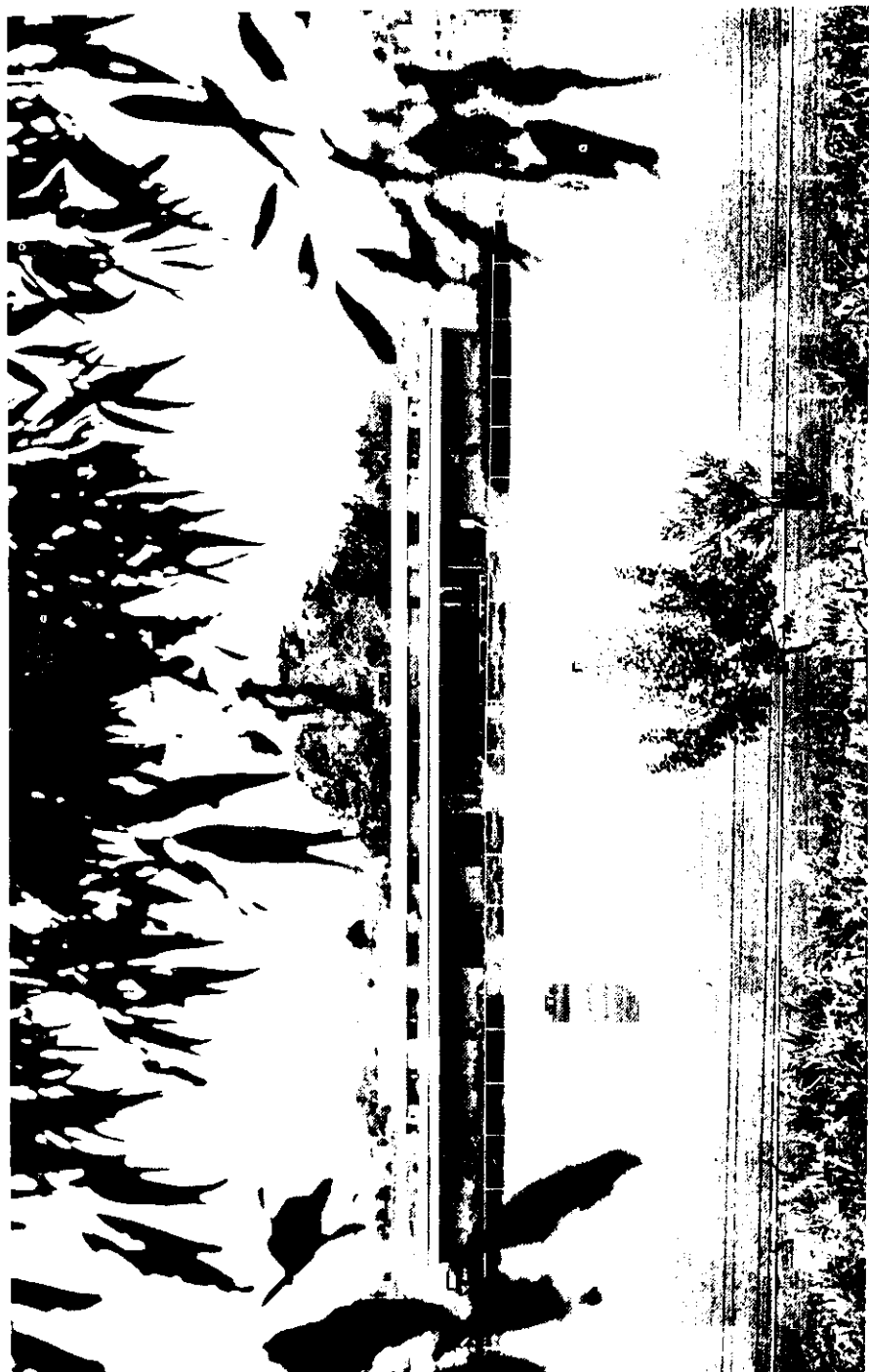
Heidelberg

## Banksia Street

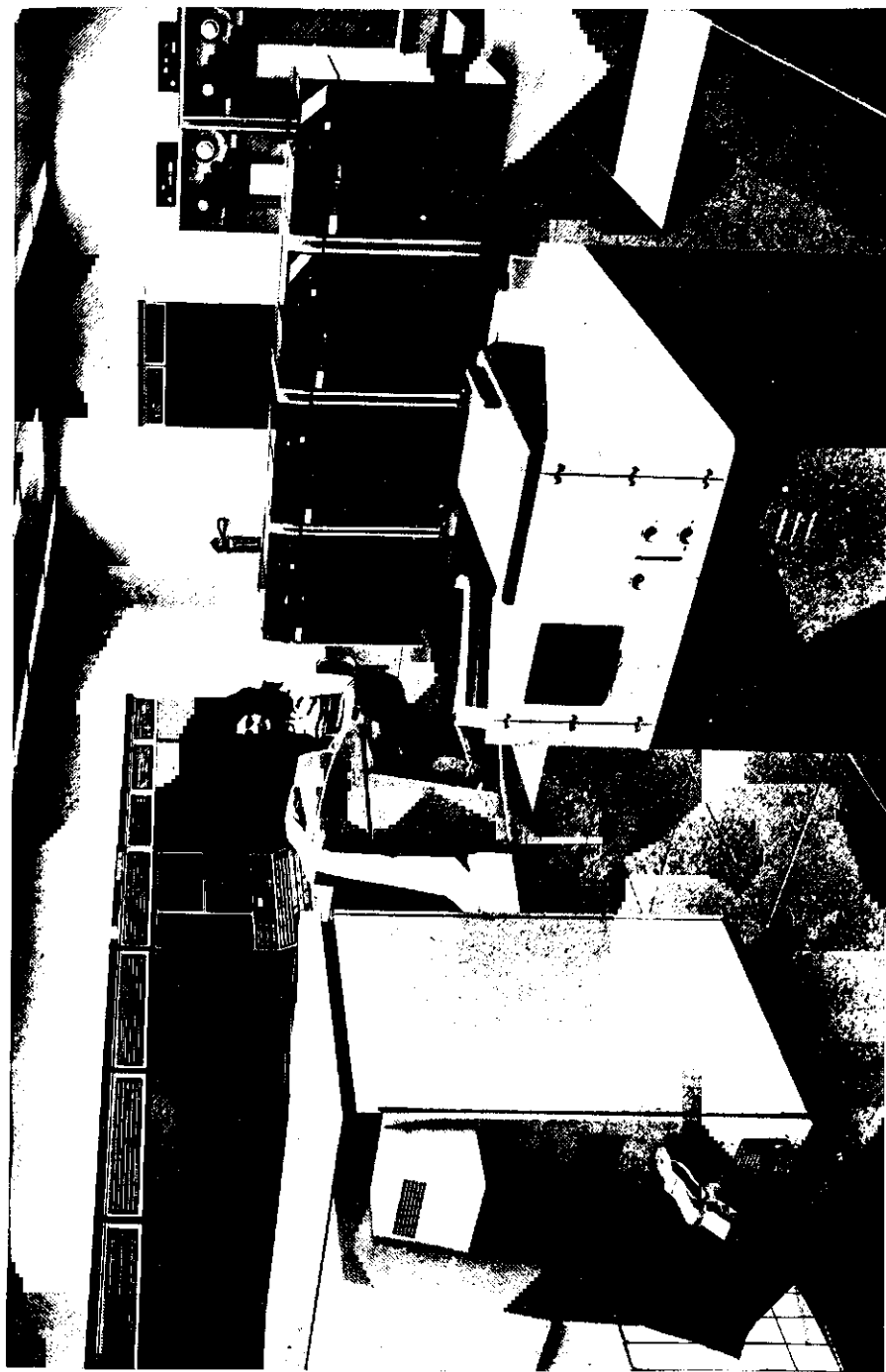
der Heidelberg Rd.



General Union building



Main oval and sports pavilion



Computer centre





Staff-student flats

**PART II: SCHOOL OF AGRICULTURE****GENERAL INFORMATION****Details of Courses**

The course in agricultural science is designed to encourage in the student a basic understanding of the relations between the soil, the plant, the animal and the environment. It should be emphasized that the degree is in agricultural science, not in agriculture. Agriculture is not only an important component of our environment, it reacts with and affects the non-agricultural components. The emphasis in the course is therefore on the sciences relevant to an understanding of the rural environment. Substantial emphasis is also given to the study of economic and social aspects of agriculture and farm management.

The biology part of the course concentrates on the sciences which are concerned with soil productivity and plant and animal production. They include soil chemistry and physics, plant and animal nutrition, physiology and biochemistry, and plant and animal health. For these, the basic science courses (first and part of second year) are chemistry, mathematics, physics and biology. Production economics, farm-management economics, rural sociology and agricultural extension constitute one-third (or more, depending on the student's interest) of the third and fourth years of the course following an introduction to the subject in the second year.

The course leads to a B Agr Sc (pass or honours degree) at the end of four years. Graduates may then do postgraduate course work and research in a specific area of agricultural biology or in agricultural economics, leading to a M Agr Sc or Ph D degree. In the case of the M Agr Sc degree, the emphasis may be either towards further course work or towards research in the chosen area.

Some 15 acres of the University campus is presently used by the School of Agriculture for field work involving crops, pastures and livestock. This gives students day to day contact with agricultural experimentation as well as with the more applied aspects of crop and animal husbandry.

All students are required to obtain at least 12 weeks' practical experience on approved farms for which no more than four weeks' credit can usually be gained on any one property. Students with a farming background and students holding a diploma from a recognized agricultural college may be granted exemption from part or all of this requirement.

Under special circumstances, students may also be given credit for practical work in non-farm activities associated with agriculture.

Agricultural science graduates find employment in a wide variety of positions in State and Commonwealth government departments, as research workers or extension officers, in advisory and teaching services or in special areas such as conservation, agricultural economics and trade. Many have joined private firms which service the agricultural industries or process agricultural products, for example, chemical and food processing companies and agricultural consultant and management groups. It can be expected that, as the Australian economy develops and agriculture adapts to the rapid changes now occurring, the opportunities open to graduates may also change. For example, there will be increasing emphasis on environment protection, conservation and land use in the coming years and agricultural scientists are well suited to undertake many tasks in these areas. Indeed many agricultural scientists have been engaged in this kind of activity for a long time. Also private organisations such as large scale primary producers, commodity boards and other marketing groups and farmer organizations may become larger employers of agricultural science graduates; there are already at least 130 non-government employers of such graduates in Australia.

It will be noted that text and reference books are not listed in this handbook. The School publishes a separate handbook which is issued to students on enrolment. It contains further information on text books and also more details of course content and requirements. This handbook is available to secondary schools on request.

### **Prerequisite for Admission**

To have passed the higher school certificate examination in chemistry and in either physics or a branch of mathematics. This is the minimum requirement; most students are expected to have done physics and at least one branch of mathematics. However, pre-requisites have been waived in the past for particular students with an appropriate background and interest in the subject. Prospective students who might fall into this category should not hesitate to contact the Dean of the School of Agriculture in the first instance. It is usually a simple matter to arrange an interview, either by letter or by telephone, particularly if this is done before mid-December. Diplomas from approved agricultural colleges are accepted as satisfying the prerequisites, providing a pass in higher school certificate English expression has been obtained, but possession of a diploma does not give automatic entry to the School.

## Quota and Selection

Unless the number of students seeking entry into the School of Agriculture is far greater in 1974 than it was in 1973, no quota will be imposed in 1974. However, should this number be greater than expected, selection will, in the first instance, be on academic merit judged by reference to examination results. Prospective students, other than those seeking entry direct from higher school certificate examination, may be required to attend for interview by the selection committee between 21 January and 16 February. Interviews outside this period can, however, be arranged by writing direct to the School of Agriculture, preferably as early as possible.

## Academic Progress

Passes in each subject will normally be graded in four categories: A, B, C and D. A: 80 to 100 per cent. B: 70 to 79 per cent. C: 60 to 69 per cent. D: 50 to 59 per cent. Less than 50 per cent constitutes a failure.

The academic progress committee of the School maintains a continuing review of students' academic progress and students may at any time of the year be asked to meet this committee to discuss their performance. A student whose progress has been considered unsatisfactory may be informed that, should he again seek enrolment, he will be required to show cause why such enrolment should be allowed. Alternatively he may be permitted to enrol but warned that subsequent failure to make satisfactory progress will mean automatic exclusion from the course. In any event a student will not be allowed to retain his place in the School if his progress continues to be unsatisfactory, and enrolment may be terminated at any time.

A student will normally be required to pass all subjects of one year before proceeding to the next year or to achieve such a standard as to be awarded a pass in the year as a whole, under conditions laid down from time to time by the Board of Studies.

## DETAILS OF SUBJECTS

### First-Year Course

Agriculture I, Biology IA (botany and genetics), Chemistry I, and Physical Sciences IT (mathematics and physics). The curricula for subjects other than Agriculture I are set out under their appropriate subject headings in the disciplines section of this handbook.

**Agriculture I:** a course of 70 lectures, plus about 20 practical classes. Agricultural botany; the classification and identification of plants (weeds, grasses and legumes) important to agriculture. (Students are required to

make a plant collection during the four years of the course; progress in this is assessed at the end of each year.) Introductory animal science, with particular reference to animal diversity, the microstructure (histology) of animal tissues and the anatomical systems of the domestic animals. Principles of climatology, with particular reference to physical aspects; climate and vegetation, climate and pasture; chemical composition of pastures and seasonal changes, introductory animal nutrition.

### Second-Year Course

The second year includes Agriculture IIA (animal physiology), Agriculture IIB (soil science), Biology II (plant anatomy and physiology, agricultural genetics – see under biology), Chemistry IIB (see under chemistry), and Agriculture IIC (economics). These subjects do not carry equal weightings; Chemistry IIB is greater and Agriculture IIC is less in content than the other three subjects.

**Agriculture IIA** is a course of about 50 lectures and 20 three-hour practical classes. The course is intended to provide an understanding of the principles of animal physiology, with emphasis on the interdependence between the different systems of the animal body, the exchanges that occur in the body, and the regulatory mechanisms that serve to maintain the constancy of the internal environment. Topics considered in detail include growth, reproduction, endocrinology and the physiology of digestion.

**Agriculture IIB** is a course of about 50 lectures and 15 three-hour practical classes, including field excursions. The course is intended to promote an understanding of the soil *as an environment* from which plants derive nutrients. The course includes: a description of the solid phases of soils and their formation; soil erosion; soil microbiology; and the chemistry of essential plant nutrients in relation to their availability to plants.

**Agriculture IIC** is a course of about 20 lectures and up to 10 tutorials. The course is intended to introduce the basic concepts and principles of economics and to demonstrate the relevance of these principles to decision-making in agriculture for the individual farm, for particular agricultural industries, and at the national and international levels.

### Third-Year Course

Agriculture IIIA (animal sciences), Agriculture IIIB (soil-plant sciences) and Agriculture IIIC (economics, agricultural economics, computing and statistical methods) each account for one-third of the third year of the course.

**Agriculture IIIA** includes nutritional biochemistry and physiology, and agricultural microbiology. *Biochemistry*: 40 lectures and 10 six-hour practical classes. Enzyme action; pathways of metabolism of carbohydrates, lipids, amino acids, proteins and nucleic acids; photosynthesis; regulation of metabolic processes; introduction to chemotherapy and the action of toxic compounds. *Physiology and Nutrition*: 40 lectures, practical classes and demonstrations. Food intake; chemistry, physiology and bacteriology of digestion and absorption in ruminants and non-ruminants; quantitative aspects of metabolism of carbohydrates, fats and proteins, hormonal control of metabolism; metabolism in undernourishment, pregnancy and lactation; energy requirements for maintenance, growth, fattening, pregnancy and lactation; protein, mineral and vitamin requirements. *Microbiology*: 20 lectures and 25 practical classes: Bacteriology: bacterial form, structure, growth and spore formation; the micro-organism and its environment; classification and nomenclature; viruses; sterilization and disinfection; microbiology of special environments, e.g. milk and milk products.

**Agriculture IIIB** deals with plants and their chemical, nutritional and physical environments. It is currently presented in three segments. *Soil physics*: 30 lectures, practical classes and field work, dealing with the use of physical methods and techniques for the description and measurement of the soil physical environment, the relation between the physical environment and plant growth. *Plant and crop physiology*: 30 lectures and practical classes and field work dealing with photosynthesis and transpiration of leaves, plants and crops as related to environmental factors; physiological basis of yield; optimum productivity; growth analysis; competition; structure, light relationships and photosynthesis of plant canopies; introduction to the simulation of plant growth. *Plant nutrition*: 30 lectures and practical classes dealing with crop germination and establishment; root development; the cell and cell membranes; nutrient uptake and transport; nutrient functions, deficiencies and toxicities; fertilizer use in relation to plant growth, animal health and pollution.

**Agriculture IIIC** has three components. *Microeconomics*: about 30 lectures and 10 tutorials in the first half of the year. Topics include the price mechanism; opportunity cost, demand and supply; the concept of elasticity; profit maximization and marginal concepts; pure competition, imperfect competition, monopoly and oligopoly; countervailing power; pricing behaviour; microeconomic policy. *Production economics*: about 30 lectures and 10 tutorials in the second half of the year. Planning under perfect knowledge: concept of production functions; law of diminishing returns;

marginality, marginal, average and total product; elasticity of production; factor-product relationships; factor-factor relationships; resource substitution; price ratios; resource combination; cost minimization; iso-cost curves; iso-product curves; resource allocation; joint products; by-products; competitive products. Planning under imperfect knowledge: concept of risk and uncertainty; basic probability theory; discounting; time and risk; planning under risk situations; planning under uncertain situations; minimizing income variations; resource allocation at the national policy level. *Statistical methods*: one lecture and one practical a week throughout the year. Populations; distributions and their properties; significance tests; linear regression; correlation; analysis of variance; experimental design. Introductory computer programming: Fortran IV.

### Fourth-Year Course

As in third year, there are three subjects: Agriculture IVA (animal sciences), Agriculture IVB (soil-plant sciences) and Agriculture IVC (agricultural economics, farm management, rural sociology and agricultural extension).

Formal contact hours (lectures or practical classes) are kept to the minimum necessary to complete the basic requirements of the course (see below) and comprise only about 30 per cent of the work load. Students must satisfy the requirements of the basic minimum courses but, by the choice of a number of advanced topics and written assignments and a 12-week research project to be carried out and written up in thesis form in third term, they are able to develop their own particular interests to a considerable extent.

Special courses in radio-active isotope usage, in basic electronics in plant and animal environment measurement and in computer simulation of physical and biological processes, have been offered as options. Applications to take units of subjects offered in other Schools will also be considered. Students in this year are also required to participate in a comprehensive seminar program arranged by the School by giving at least two seminars themselves and attending others given by postgraduate students, by members of staff or by distinguished visiting lecturers.

The basic (minimum) courses are as follows:

**Agriculture IVA:** A two-term course of lectures plus practicals. Part of the course is devoted to *Parasitology* — life histories of parasitic arthropods and helminths; epidemiology and current methods of parasitic disease control; *Infectious diseases* — the nature of and the factors which determine the onset of infectious disease; mode of transmission with examples of endemic and exotic diseases; quarantine; *Immunology* — natural resistance and acquired immunity; antigenic determinants and antibodies,

vaccination and hypersensitivity, serology. The rest of the course consists of lectures on selected topics of special importance in animal production, given partly by the staff of the School and partly by visiting lecturers who are recognized authorities in their fields. Such special courses have covered human and animal nutrition, animal reproduction, growth and development, animal breeding, antibiotics, plants poisonous to animals etc.

**Agriculture IVB:** A two-term course of lectures plus practicals. Part of the course is devoted to *Entomology* – a brief synopsis of insect classification; feeding habits and types of damage; insect and mite pests of agricultural importance with special reference to Australia; chemical, biological, cultural and other control methods; integrated control and pest management; *Plant pathology* – an introductory course to applied mycology, virology and nematology. The rest of the course consists of lectures on selected topics of special importance in the plant-soil sciences, given partly by the staff of the School and partly by visiting lecturers who are recognised authorities in their fields. Such special courses have covered soil and tissue testing, cultivation and soil structure, crop physiology, forage crops and fodder conservation etc.

**Agriculture IVC:** The course has two components, *Sociology and extension*: 12 lectures. Communication; perception; empathy; meaning; organizations; filtration and overload; spreading new ideas in rural areas; the importance of opinion leaders; motivation; getting ideas into practice; a theory of social action. *Agricultural economics and business management* – three lectures a week in first and second terms plus assignments and topics. The estimation of response surfaces; functional forms for production functions; the role and functions of management; farm business analysis, budgets, gross margins and programming methods for farm planning; farm planning under risk; long-run farm planning; systems analysis in agricultural management; agricultural marketing; agricultural prices; organization in agriculture; government intervention and agricultural policy; farm finance; evaluation of public investment in agriculture; technical change.

## Excursions

Some excursions are an essential part of certain subjects, and are therefore compulsory; others are optional. Compulsory excursions are normally paid for by the School; the costs of optional excursions must be met by the student.

Half-day and full-day excursions form part of the second, third and fourth years. The major optional excursion will be in the last week of the August vacation in fourth year and most cost from \$25 to \$50, but it will be organized only if enough students are available.



## PART III: SCHOOL OF BEHAVIOURAL SCIENCES

### INTRODUCTION

The School of Behavioural Sciences was founded in 1973 and consists of the departments of genetics, psychology, sociology and zoology. Plans are under consideration for the addition of new departments at the senior undergraduate and post-graduate levels.

Students may enrol in the School of Behavioural Sciences either for the degree of BA or B Sc. In either case they are required to complete three psychology units, Biology IB or Behavioural Biology IT.

Subject to being able to satisfy any prerequisites, students are permitted to select their remaining five units from courses in genetics, sociology and zoology in the School of Behavioural Sciences; also biochemistry, chemistry, legal studies, mathematics, philosophy, physics, and politics in other Schools. Other courses may also be permitted in special cases with the approval of the board of studies provided that not more than three subjects are undertaken outside the School of Behavioural Sciences. Furthermore, some students may wish to combine study in psychology with the concurrent course in education for the Diploma in Education. Such students should discuss their plans with a member of staff before enrolling.

The subjects for the courses may be taken in any combinations, provided that the total number of first-year-level units does not exceed four, and that the total number of third-year-level units is at least two.

The following are typical patterns of the course structures in the School of Behavioural Sciences requiring a total of nine units in each case.

### BACHELOR OF SCIENCE DEGREE

Students enrolled for the B Sc degree must have satisfactory science prerequisites. (Chemistry and at least one subject out of physics, biology and mathematics at Victorian higher school certificate or its equivalent.) The available options are as follows:

**First Year:** Psychology I\*, Biology IB or Behavioural Biology IT\*, one other science unit, and one other unit.

**Second Year:** Psychology II. \*One other science unit, and one other unit.

**Third Year:** Psychology III. \*One other science unit.

\*These science units must form a sequence, based on Biology IB or on the other first-year science unit.

## BACHELOR OF ARTS DEGREE

There are no prerequisites for students enrolling for the BA degree. The available options are as follows:

**First Year:** Psychology I, preferably Behavioural Biology IT, and one other unit.

**Second Year:** Psychology II. One or two other units, \*at least one from the School of Behavioural Sciences.

**Third Year:** Psychology III. One or two other units, \*at least one from the School of Behavioural Sciences.

\*These units are normally chosen from legal studies, mathematics, philosophy, politics, and sociology. (See introduction)

## CONCURRENT STUDY OF BIOLOGY

It is felt that the fullest understanding of behaviour and of psychology today requires some background in biology. For this reason, students taking Psychology I are strongly advised to include a Biology I unit in their first-year studies. Those students who wish to go on to higher-year studies in biology (and who have the necessary prerequisites), should take Biology IB. Those students who are only seeking a grounding in biology as background to studies in psychology, should take Behavioural Biology IT. This is a one-year course, especially designed to give the appropriate background for students in behavioural sciences.

Neither Biology I unit is a firm prerequisite for entry to Psychology II, and students may go on to higher studies in psychology without Biology I. However, it is our academic advice that an introduction to modern biology will complement and assist study in psychology. Further, it will be assumed that students who elect to take the psychobiology option within Psychology II have completed a Biology I unit.

## CONCURRENT COURSES IN EDUCATION

Since 1973 at La Trobe University a concurrent course has been offered leading to the award of a bachelor degree and a Diploma in Education and the following are some of the patterns possible in the School. Other patterns may be developed in consultation with advisers of studies of the School of Behavioural Sciences:

A possible pattern of courses with BA degree —

Year	Major Subject	Minor Subject	Third Subject	Education
1	Psychology I	Sociology I	Behaviour Biology IT	—
2	Psychology II	Sociology II	—	Education II
3	Psychology III	Sociology II (2x½ units)	—	Education III
4	—	Sociology III	Sociology III (2x½ units)	Education IV

A possible pattern of courses with B Sc degree —

Year	Major Subject	Minor Subject	Third Subject	Fourth Subject	Education
1	Psychology I	Biology IA	Biology IB	Mathematics I	—
2	Psychology II	Genetics II	—	—	Education II
3	Psychology III	Zoology II	—	—	Education III
4	—	Genetics III	—	—	Education IV

## **B Sc (HONOURS) AND HIGHER DEGREES**

Students wishing to obtain the degree of B Sc (honours), M Sc or Ph D may be accepted by the department of psychology provided their previous academic record is of high standard, and approval of the board of studies is required. Prospective candidates should contact the chairman of the department for further information.

Details of the psychology courses offered in 1974 are shown in the disciplines section of this handbook. Details of degree structures for the BA and B Sc degree will be available from the psychology department.

**Note:** The course and degree structures, particularly the degree of BA and prerequisites for the degree of B Sc, for the School of Behavioural Sciences are under review. It is not expected that changes will be made in 1974.

## **PART IV: SCHOOLS OF BIOLOGICAL AND PHYSICAL SCIENCES**

### **DEGREE OF BACHELOR OF SCIENCE IN THE SCHOOLS OF BIOLOGICAL AND PHYSICAL SCIENCES**

A person may undertake the B Sc degree course in either the School of Biological Sciences or the School of Physical Sciences. In making application for entry into the B Sc degree students should give some consideration to the subjects proposed for study in later years of the course. Students contemplating physical science subjects as major studies should apply for entry into the School of Physical Sciences; students contemplating biological sciences subjects should apply for entry into the School of Biological Sciences. In the event of a student's interests changing during the first year the student may change Schools subject to the approval of the appropriate board of studies.

The pass degree will consist of subjects which have a total work value of nine units, including one each year from the main discipline and should be taken over a period of not less than three years.

An honours degree will be awarded on the basis of a fourth year of study upon completion of the pass-degree course. A pass in a science language may be a requirement for an honours degree, but not for the pass degree.

Completion of a subject includes attendance at such lectures and tutorial classes as prescribed as well as completion of such exercises and laboratory work as shall satisfy the discipline concerned. If a student has not complied with the prescribed requirements, he may be refused admission to the annual examination in that subject. Reasonable notice of the prescribed requirements will be given.

At the beginning of each year, a student shall obtain the approval of an adviser of studies of the School for his proposed selection of subjects to be completed in that year.

No student may: (a) take subjects which have a total work value of more than four units in the first year; (b) take a second-year level subject until he has completed first-year subjects with a total work value of three units, except with the permission of the School.

Except with the approval of the School, a candidate shall complete all subjects within a period of six years from the beginning of the academic year in which he completes the first of such subjects.

Part-time enrolment in the sciences involving laboratory work will normally not be permitted.

## SCHOOL OF BIOLOGICAL SCIENCES

Four disciplines are offered in the School of Biological Sciences: biochemistry, botany, genetics and zoology.

The prerequisites for the School of Biological Sciences are passes in the higher school certificate examination in chemistry and one of physics, biology or a branch of mathematics.

The details of the course structure for this School are found under the heading of the degree of Bachelor of Science in the Schools of Biological Sciences and Physical Sciences. With the approval of the School the student may choose from a wide range of combinations of subjects from biological and physical sciences. Agriculture I offered by the School of Agriculture may also be chosen subject to approval of the School.

## SCHOOL OF PHYSICAL SCIENCES

The prerequisites for the School of Physical Sciences are passes in the higher school certificate examination in one of the following combinations of subjects: (a) any two of chemistry, physics, pure mathematics, applied mathematics; (b) general mathematics and either chemistry or physics.

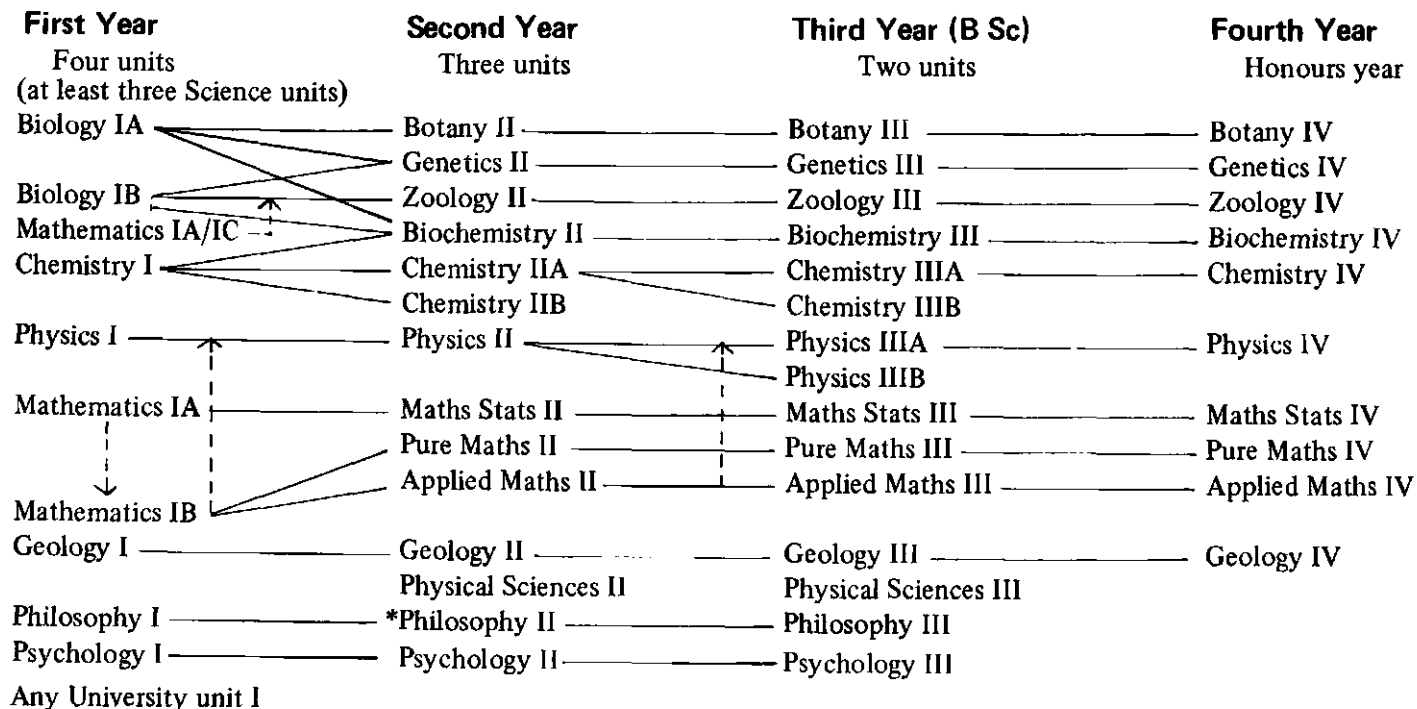
Four disciplines are offered in the School of Physical Sciences: chemistry, geology, mathematics and physics.

In the first year a student is required to take four units. One of these may be a first-year course offered by the School of Biological Sciences and one may be a subject from the School of Humanities or the School of Social Sciences or the department of psychology. Students enrolled in the School who wish to take a unit in mathematics are required to take Mathematics IA and/or Mathematics IB. Mathematics IC is available only to students enrolled in other Schools.

At the second-year level where three units are required, a student may offer one unit from the School of Biological Sciences or one in philosophy or one in psychology. One unit of biology or philosophy or psychology may also be offered at third-year level.

The School of Physical Sciences, in conjunction with the department of economics, also offers a course leading to a B Sc degree in which economics can be taken with science subjects. The course consists of nine-and-one-half units, four in the first year, three-and-one-half in the second and two in the third year. Students interested in this course should discuss details with an adviser of studies of the School of Physical Sciences.

## SUBJECT SEQUENCES



Note: One subject crossed by prerequisite line - - - - -  
required for continuation of sequence

\* Philosophy II – prerequisites are, Philosophy I or any University unit I

## FIRST-YEAR SUBJECTS

Four subjects to be taken from the following, each of which has a work value of one unit:

Biology IA, Biology IB, Chemistry I, Geology I, Mathematics IA and IB, Mathematics IC (cannot be taken in combination with Mathematics IA or Mathematics IB), Physics I, subjects with a total work value of one unit from the School of Humanities or the School of Social Sciences or the department of psychology. (Social Sciences IA-IB and Social Sciences IA-IC are not acceptable for this purpose). Disciplines available in the Schools of Humanities and Social Sciences are economics, English, French, history, history and theory of art, Italian, legal studies, philosophy, politics, sociology and Spanish.

To complete his first year a student shall: (a) pass in subjects which have a total work value of four units *or* (b) be passed by the School in the year as a whole.

Normally, all students in the School of Biological Sciences must take Biology IA and IB. Students in the School of Physical Sciences can take either Biology IA or Biology IB but not both.

Students taking the combined science/economics course can choose three units from the physical sciences subjects with Economics I.

## SECOND-YEAR SUBJECTS

Subjects which have a total work value of three units to be taken from Applied Mathematics II, Biochemistry II, Botany II, Chemistry IIA, Chemistry IIB, Genetics II, Geology II, Mathematical Statistics II, Philosophy IIFA, Philosophy IIFB, Philosophy IIPM, Philosophy IISA, Psychology II, Physics II, Pure Mathematics II, Physical Sciences II or Zoology II.

Only two of the philosophy subjects may be taken (all are half units). Chemistry IIA and IIB cannot be taken in combination. Students from the School of Biological Sciences must take at least two from Biochemistry II, Botany II, Genetics II and Zoology II.

Students taking the combined science/economics course can choose two units from the physical sciences subjects with one-and-one-half economics units.

Details of individual subjects are given in the section on the discipline concerned. A table showing the prerequisites and work value for each unit appears elsewhere in this handbook.

### THIRD-YEAR SUBJECTS

Subjects which have a total work value of two units to be taken from: Applied Mathematics III, Biochemistry III, Botany III, Chemical Physics III, Chemistry IIIA, Chemistry IIIB, Computer Science III, Genetics III, Mathematical Statistics III, Philosophy IIIFA, Philosophy IIIFB, Philosophy IIILA, Philosophy IIIPM, Philosophy IIISB, Philosophy IIISA, Psychology III, Physics IIIA, Physics IIIB, Pure Mathematics III, Physical Sciences III or Zoology III.

Chemistry IIIA and IIIB cannot be taken in combination. Any three of the listed philosophy subjects may be taken (providing they have not already been taken at second year) to form a third-year science unit.

Students taking the combined science/economics course can choose one unit from physical sciences with one economics unit.

Details of individual subjects are given in the section on the discipline concerned. A table showing the prerequisites and work value for each unit appears elsewhere in this handbook.

### HONOURS DEGREE

Entry to the fourth year will be limited to those who have reached a satisfactory standard in the course for the pass degree. Graduates from other universities may also be admitted in special circumstances. To qualify for the honours degree, students should enrol on a full-time basis. Successful students will be awarded first-class, second-class (upper division), second-class (lower division), or third-class honours.

It is intended to allow specialization in a range of studies reflecting the academic interests of the Schools. The School of Physical Sciences will offer fourth-year courses in chemistry, geology, mathematics, and physics and one of an interdisciplinary nature. The School of Biological Sciences offers honours courses in biochemistry, botany, genetics and zoology. Entry to an honours-degree course in the School of Biological Sciences will be at the discretion of the chairman of the department concerned and will be decided on the results obtained in the pass-degree course taken in the School or elsewhere.

### ACADEMIC PROGRESS

The results of a student who completes a pass or honours subject will be graded in four categories: A, B, C and D. A :80 to 100 per cent. B: 70 to 79 per cent. C: 60 to 69 per cent. D: 50 to 59 per cent. Less than 50 per cent constitutes a failure.



## ACADEMIC PROGRESS

Each year the academic progress committees of the Schools review the academic progress of students. A student whose progress has been considered unsatisfactory may be informed that should he again seek enrolment in a course or in a subject he will be required to show cause why such enrolment should be allowed. Alternatively he may be permitted to re-enrol but warned that subsequent failure to make satisfactory progress will mean automatic exclusion from that course or from that subject.

A student will not be allowed to continue his enrolment in any subject in which he is not making satisfactory progress. The final assessment of a student's progress may take into account his performance in tutorials, practical work, assignments and any other prescribed work.

A student who fails to meet the requirements established by each School may be considered not to have made satisfactory academic progress. In attempting to meet these requirements, a student will not normally be permitted to enrol for any subject more than twice.

A full-time student will normally be expected to obtain a work value of at least two units at the end of the annual examinations in his first year, at least four units within two calendar years, and at least seven units within four calendar years. A full-time student will be expected to complete the requirements for his degree within six calendar years of his first effective enrolment. A student having more than one unit outstanding shall not normally proceed to the next year's course.

The minimum rate of progress for a part-time student will be determined by the Board of Studies in each individual case.

### DEGREE OF BACHELOR OF SCIENCE IN THE SCHOOL OF BEHAVIOURAL SCIENCES

Students may take a Bachelor of Science degree course in the School of Behavioural Sciences. Details are shown in the entry for that School, see Part III of this handbook.

## PART V: GRADUATE STUDIES

Graduates may apply at any time to be admitted as candidates for the degrees of Master of Science, or Doctor of Philosophy. An appropriate honours degree will normally be the preliminary requirement for admission to any postgraduate-degree course. In some disciplines it may be possible to complete the work for the master's degree by thesis, by course work or a combination of the two. In most disciplines it is possible to read for a master's degree on a part-time basis. Persons seeking enrolment for a higher-degree course should first contact the professor of the appropriate discipline to discuss their particular research interests, as consideration of an application for a higher-degree course will depend on the availability of facilities and suitable supervisors. The candidature of each prospective student must be approved by the appropriate higher-degree committee before the student can be admitted to the University.

Further information on the fields of research pursued appears under the appropriate discipline.

## PART VI: DISCIPLINES

The following pages contain details of the disciplines in which subjects are offered. The disciplines are listed in alphabetical order. Information on examination requirements, lectures and other work requirements and postgraduate studies are included. Details of incompatible, companion and prerequisite subjects are set out in the table of subjects. Details of disciplines offered in the Schools of Education, Humanities and Social Sciences are included in a separate volume of the handbook.

### AGRICULTURE

For details of agriculture subjects see the School of Agriculture entry in this volume of the handbook.

### BIOCHEMISTRY

The department of biochemistry offers courses which form part of the second and third year of the B Sc (pass) degree and may lead to a B Sc (honours) degree in biochemistry. Postgraduate training to the M Sc and Ph D levels is also available.

The courses available provide instruction in both theoretical and practical aspects of the subject and may be taken with other subjects offered by the School of Biological Sciences, the School of Physical Sciences and the School of Behavioural Sciences. It is thus possible to vary the course structure to obtain background experience suitable for different professional careers.

A sound biochemical training must be founded on a strong basis of chemistry as well as a good background in biological principles and techniques. The courses set out below incorporate these features.

#### **First Year**

##### *Biological Sciences Students:*

Biology IA, Biology IB, Chemistry I, and one other subject.

##### *Physical Sciences Students:*

Biology IA or IB, Chemistry I, and two other subjects.

##### *Behavioural Sciences (B Sc stream)*

Biology IB, Chemistry I, Psychology I, and one other subject

#### **Second Year**

Biochemistry II and two of: Botany II, Genetics II, Zoology II, Chemistry

II, IIA or IIB, any other second-year physical sciences subject, Psychology II, Philosophy II.

### Third Year

Biochemistry III and one of: Botany III, Chemistry IIIB, Genetics III, Zoology III, Psychology III.

Details of the courses offered by the biochemistry department are described below. Further information may be obtained from the chairman of the department or from the adviser of studies.

### BIOCHEMISTRY II

**Syllabus:** Protein structure and function; basic enzymology; polynucleotide structure/function/synthesis; protein synthesis; lipids and membranes; polysaccharide structure and synthesis. Carbohydrate and lipid metabolism; energetics and biological oxidations; nitrogen metabolism; metabolic control; digestion and absorption.

**Prerequisites:** 1. Chemistry I; 2. Biology IA or IB.

**Class Requirements:** The course consists of three lectures a week and an average of three hours practical work a week throughout the year in experiments concerning techniques in quantitative biochemistry.

**Prescribed Text:** One of:

Lehninger, A.L. *Biochemistry* Worth 1972

Conn, E.E. and Stumpf, P.K. *Outlines of Biochemistry*  
Wiley International 1972

Bohinski, R.C. *Modern Concepts in Biochemistry*  
International Student edn 1973

### Recommended for Reference

McGilvery, R.W. *Biochemistry – A Functional Approach* Saunders 1970

Mahler, H.R. and Cordes, E.H. *Biological Chemistry* 2nd edn, Harper 1971

White, A., Handler, P. and Smith, E.L. *Principles of Biochemistry* 4th edn  
McGraw Hill 1968

Rees, D.A. *The Shapes of Molecules* Oliver and Boyd 1967

Barker, R. *Organic Chemistry of Biological Compounds* Foundations of  
Modern Biochemistry Series, Prentice Hall 1971

**Examination Requirements:** Candidates will be examined by one two-hour and two three-hour written papers to be given at the end of the course and by written tests and assignments during the year.

Performance in practical work will be assessed weekly.

Students must obtain a satisfactory standard in both the theoretical and practical aspects in order to pass the course.

## BIOCHEMISTRY III

**Syllabus:** The chemistry, physico-chemistry and biochemistry of macromolecules of biological importance. The kinetics and mechanism of enzyme action. The biochemistry of cell membranes in relation to energy transformations and cellular transport phenomena. The integrated operation and functions of metabolic pathways for the metabolism of carbohydrates, lipids, amino acids, purines and pyrimidines. The regulation of metabolism at the cellular, tissue and whole organism levels. Cellular and tissue specificity in metabolism. Metabolism in selected nutritional and abnormal states. Developmental biochemistry – regulation of RNA and protein synthesis – differentiation, ontogeny of enzymes, organogenesis. Biochemical evolution. Selected topics in the biochemistry of foods, drug metabolism and clinical biochemistry.

**Prerequisite:** Biochemistry II.

**Class Requirements:** The course consists of four lectures a week throughout the year and an average of 10 hours a week practical work or practice classes concerned with experimental methods and calculations in physical biochemistry, enzymology, metabolism, and the separation and analysis of biological molecules and organelles.

**Books:** No text is prescribed but the following books between them cover most aspects of the course. Other literature relevant to special sections of the course will be advised by the lecturers concerned.

McGilvery, R.W. *Biochemistry – A Functional Approach* Saunders 1970

Mahler, H.R. and Cordes, E.H. *Biological Chemistry* 2nd edn, Harper 1971

Dawson, R.M.C., Elliot, J. and Elliot, W.M. *Data for Biochemical Research* 2nd edn, Oxford University Pr. 1969

Dixon, M. and Webb, E.C. *Enzymes* 2nd edn, Longmans 1964

Bernhard, S. *The Structure and Function of Enzymes* Benjamin 1968

Van Holde, K.E. *Physical Biochemistry* Prentice Hall 1971

Tanford, C. *Physical Chemistry of Macromolecules* John Wiley 1961

Larner, J. *Intermediary Metabolism and its Regulation* Prentice Hall 1971

Cohen, G.N. *The Regulation of Cell Metabolism* Holt, Rinehart and Winston 1968

Frieden, E. and Lipner, H. *Biochemical Endocrinology of the Vertebrates* Prentice Hall 1971

Watson, J.D. *Molecular Biology of the Gene* 2nd edn, Benjamin 1970

Davidson, E. *Gene Activity in Early Development* Academic Press 1968

Markert, C.L. and Ursprung, H. *Developmental Genetics* Prentice Hall 1971

**Examination Requirements:** Candidates will be examined by three three-hour written papers to be given at the end of the course and by written tests and assignments during the year.

Performance in practical work will be assessed continuously throughout the year.

Students must obtain a satisfactory standard in both theoretical and practical aspects in order to pass the course.

### **HONOURS**

A one-year honours course in biochemistry is available to graduands from La Trobe, or from other universities with equivalent B Sc courses. The course consists of a research project, lectures, student seminars and such other work as may be required.

As the research project is the major component of the course, students desiring to enrol are expected to have demonstrated a high standard in practical work, as well as having achieved a satisfactory overall performance in both Biochemistry III and their other third-year subject. Students intending to enrol in the honours course should consult the chairman of the department.

### **POSTGRADUATE STUDY**

Prospective M Sc and Ph D students should contact the chairman of the department.

## **BIOLOGY**

Biology IA and IB will be available in the first year. These are courses in botany and zoology respectively, with a course on genetics and evolution common to both subjects. These subjects qualify students for a wide range of second-year biological subjects as set out in the table in Part IV. Details of second-year and subsequent studies in the School of Biological Sciences can be found under the headings Biochemistry, Botany, Genetics and Zoology.

### **BIOLOGY IA (BOTANY AND GENETICS) AND**

### **BIOLOGY IB (ZOOLOGY AND GENETICS)**

#### **Prerequisites for 1974**

(a) For students enrolled in the School of Biological Sciences – a pass in chemistry *and* in any one subject from physics, biology *or* a branch of mathematics in the Victorian higher school certificate examination or an approved equivalent.

(b) For students not enrolled in the School of Biological Sciences – a pass in chemistry in the Victorian higher school certificate examination or an approved equivalent.

## **Botanical Component Biology IA (50 lectures)**

This course is designed to introduce students to the major disciplines of botany and also to serve as a one-year terminal course for students who do not wish to pursue the study of plant science into later years of their course.

**Syllabus:** The following topics are covered:

1. Structure and physiology of higher plants including studies of the ultrastructure of plant cells (27 lectures).
2. A survey of the major groups of plants with emphasis on evolutionary considerations (14 lectures).
3. Studies of the relationship between plants and the environment – an introduction to the principles of plant ecology (9 lectures).

**Preliminary Reading:** Students are assumed to have some knowledge of biology. Students whose school record does not include HSC biology are encouraged to read the following book in the long vacation before the commencement of the course:

Biological Science: *The Web of Life* 2nd edn. Written and published by Australian Academy of Science

### **Prescribed Reading**

Raven, P.H. and Curtis, H. *The Biology of Plants* Worth Publications Inc.

Students are also required to purchase a special manual produced by the botany department for use in conjunction with practical work. The practical manual (and other equipment necessary for the practical course) will be available for purchase before the beginning of the academic year. Details will be mailed to all students enrolled for Biology IA as soon as possible after enrollments. Additional reading will be provided during the lecture course.

### **Assessment**

1. Performance in practical reports, problems, tests, essays and any other assignments set throughout the year.
2. A written examination at the end of the course.

## **Zoological Component Biology IB (50 lectures)**

This course is a basis for those students wishing to proceed to the advanced zoology courses. Although it may serve as a one-year terminal course, it was not designed as such.

**Syllabus:** The diversity of structure and function in the main groups of animals will be studied from an evolutionary point of view. Introductions to the physiology of mammals, and to animal ecology, behaviour, embryology and reproduction will also be presented.

### **Prescribed Reading**

Weiz, P.B. *The Science of Zoology* McGraw-Hill

Students should obtain a set of practical notes, practical record book and a dissecting kit before the first practical which will be held in the first week of term.

### **Genetical Component Biology IA and Biology IB (25 lectures)**

The following course is common to Biology IA and IB: principles of genetics; introduction to population, quantitative and human genetics; genes and metabolism; the genetic code and protein synthesis; processes of organic evolution; the nature of human variation.

### **Prescribed Reading**

Stebbins, G.L. *Processes of Organic Evolution* 2nd edn, Prentice Hall 1971  
Genetics Notes by the department of genetics.

### **Class Requirements (in Biology IA and IB)**

Lectures – three a week for three terms. Practical tutorial classes one 4-hour class a week for three terms; one excursion (Biology IB). The botanical and zoological components of Biology IA and IB will consist of 50 lectures with corresponding practical classes, and the genetical component will be a course common to both subjects consisting of 25 lectures with corresponding practical classes and tutorials.

## **BIOLOGY II**

This is a special course for students enrolled in the School of Agriculture and consists of a selected portion of the Botany II course together with a special course in agricultural genetics given by the genetics department.

The botanical component will deal with the anatomy and physiology of vascular plants with emphasis on plant growth and development, tissue differentiation and the control of various aspects of growth by growth-regulating substances (see section I of Botany II syllabus).

The genetics component will comprise various topics of specific interest to agricultural scientists, viz. genotype-environment interactions, genetic analysis of quantitative characters, selection theory, selection techniques in plants and animals, cytogenetic techniques in plant breeding, hybrid varieties and plant ecogenetics.



## BOTANY

### BOTANY II (75 lectures)

**Preliminary Reading:** Students are encouraged to do some reading in the long vacation prior to the commencement of the course. The following books are recommended.

Greulach, V.A. *Plant structure and function* Macmillan Co., New York; Collier-Macmillan Pub., London

Billings, W.D. *Plants, man and the ecosystem* Macmillan, London 1971

### Syllabus and Prescribed Reading

1. Anatomy and physiology of vascular plants with emphasis on plant growth and development, tissue differentiation and the control of various aspects of growth by growth-regulating substances (26 lectures)  
This section also forms part of the subject Biology II.

#### Reading

Black, M. and Edelman, J. *Plant Growth* Heinemann 1970

Esau, K. *Plant Anatomy* 2nd edn, J. Wiley and Sons Inc. 1965

2. The ecology of terrestrial plants with emphasis on their life cycles in relation to the environment and the effect of environmental and biotic factors on the distribution of individual plant species. (12 lectures).  
Reading — non prescribed.
3. Aspects of the biology of fungi including soil microbiology and plant pathology (13 lectures)

#### Reading

Deverall, B.J. *Fungal Parasitism* (Studies in Biology No. 17) Edward Arnold, London 1969

Alexopoulos, C.J. *Introductory Mycology* 2nd edn, J. Wiley and Sons Inc. 1962

4. Physicochemical aspects of the water and solute relations of plant cells (12 lectures).

#### Reading

Levin, R.J. *The Living Barrier* Heinemann

5. The principles of angiosperm taxonomy. Aspects of plant variation and speciation with reference to their taxonomic description. A practical introduction to the families of flowering plants (12 lectures)

#### Reading

Heywood, V.H. *Plant Taxonomy* (Studies in Biology No. 5) Edward Arnold, 1967

Hutchinson, J. *Key to the Families of Flowering Plants of the World*  
Oxford Univ. Pr. 1967

### Prerequisites

1. Biology IA.
2. At least one of the following: Chemistry I, Physics I, or a branch of first-year mathematics.

### Class Requirements

Lectures — three hours a week for three terms. Practical/tutorial classes — two three-hour classes a week for three terms. A field trip of approximately five days' duration will be held in Orientation Week, March 4 to March 8, 1974. This is an essential part of the practical course and reports based on it will be used in the final course assessment. It will not be possible to set alternative work.

### Assessment

1. Performance in practical and field reports and any other assignments set throughout the year.
2. Three three-hour written examinations at the conclusion of the course.

## BOTANY III (100 lectures)

### Preliminary Reading

Students are encouraged to do some reading in the long vacation prior to the commencement of the course. The following books are recommended.

Harre, R. *The Method of Science* Wykeham Publications, London 1970  
Daubenmire, R. *Plant Communities* Harper and Row, New York 1968

### Syllabus and Prescribed Reading

1. Plant biochemistry: bioenergetics, enzymology, intermediary metabolism of carbohydrates and lipids in plants; oxidative phosphorylation. The biochemistry of photosynthesis, nitrate reduction and sulphate reduction (20 lectures).

**Reading** — Goodwin, T.W. and Mercer, E.I. *Introduction to Plant Biochemistry* Pergamon Press 1972

or

Conn, E.E. and Stumpf, P.K. *Outlines of Biochemistry* 3rd edn, John Wiley and Sons Inc., student edn, 1972

2. Plant ecology, including studies of plant succession, vegetation dynamics and plant palaeogeography (8 lectures) Reading — none prescribed.
3. Aspects of plant cell physiology. Membrane phenomena and the movement of water and solutes. Bioenergetics (13 lectures)  
Reading — none prescribed.

4. Studies of selected plant pathogens. Factors affecting host penetration; The role of melanins in fungi (10 lectures).

**Reading** — Wood, R.K.S. *Physiological Plant Pathology* Blackwells, Oxford 1967

5. The ultrastructure and function of plant cells. A survey of current views of the structure of cell membranes, the structure of cellular organelles and their ontogeny, interrelation and continuity, as well as a discussion of selected topics relating to the evolution of cellular organelles and cytological aspects of cell differentiation (14 lectures).

**Reading** — Clowes, F.A.L. and Juniper, B.E. *Plant Cells* Blackwells, London 1962

6. Detailed morphological survey of the families and genera of gymnosperms, their geographic distribution, evolution, reproduction and embryogeny (12 lectures).

**Reading** — Sporne, K.R. *The Morphology of Gymnosperms* Hutchinson University Library 1965

Foster, A.S. and Gifford, E.M. Jr. *The Comparative Morphology of Vascular Plants* Freeman and Co. 1959

7. Aspects of the biology of algae including growth and nutrition, photosynthesis, ultrastructure and ecology (10 lectures)

**Reading** — Chapman, V.J. and Chapman, D.J. *The Algae* Macmillan 1973

8. Advanced taxonomy, with particular emphasis on chemical and numerical taxonomy (13 lectures)

**Reading** — none prescribed

**Prerequisite:** Botany II

## **Class Requirements**

Lectures — four one-hour lectures a week for three terms. Practical work — one three-hour and one six-hour practical class a week for three terms.

## **Assessment**

1. Performance in practical and field reports and any other assignments set throughout the year.
2. Written examinations at the conclusion of the course.

## **BOTANY IV (HONOURS COURSE)**

A fourth-year course is available to students who have fulfilled the requirements of the B Sc degree at La Trobe or other Universities provided that their previous academic record is of a high standard. The academic record should include Botany III but graduates whose record does not

include Botany III can gain admission to Botany IV provided their application is approved by the board of studies of the School of Biological Sciences. The course consists of a research project together with other prescribed work including essays and seminars. The course lasts approximately nine months beginning on 4 February, 1974.

### POSTGRADUATE STUDIES

The department offers research programs leading to the degrees of M Sc or Ph D. Prospective candidates should consult the chairman of the department for further details.

Research is currently in progress in the following fields: the ultra-structure and anatomy of plants; aspects of the physiology, biochemistry and biophysics of plants; plant pathology; plant taxonomy and plant ecology.

## CHEMICAL PHYSICS

An interdisciplinary course of study within the School of Physical Sciences, chemical physics offers a coherent program leading to the B Sc (pass) and B Sc (honours) degree.

The course is designed to provide a solid grounding in the field of chemical physics, and will serve either as a suitable training for teachers of physics or chemistry and for industrial appointments, or as an introduction to postgraduate research. In addition, the structure is such that there is more flexibility for branching towards either physics or chemistry than is otherwise possible.

Students wishing to follow this course should, in any year after the first, discuss their choice of physics, chemistry or mathematics components with the respective student advisers.

### FIRST YEAR

Physics I, Chemistry I, Mathematics IA and Mathematics IB are the subject units required for the first year of the course. This combination also leads to any second-year subject other than geology offered in the School of Physical Sciences.

### SECOND YEAR

Physics II, Physical Sciences II and Applied Mathematics II form the recommended course units for enrolment. Because of the requirements for

Applied Mathematics III the suggested composition of Physical Sciences II is: Chemistry IIA, Physical (1/3 unit), Mathematics II, PM 201, PM 202, PM203, AM205 (2/3 unit).

This course is also suitable for students intending to major in pure physics. An alternative course which instead would also be suitable for students considering specializing in chemistry is Physics II, Chemistry IIA and Applied Mathematics II.

## THIRD YEAR

Chemical Physics III is a composite two-unit course comprizing components from Physics IIIA, Chemistry IIIA (physical), and Applied Mathematics III. It is open to students who have passed in either of the preceding courses, but those with the latter alternative will probably have to modify the applied mathematics segment. The recommended components (with credit points in brackets) are:

**Physics IIIA:** Electromagnetic Theory (2), Nuclear Physics (2), Statistical Mechanics (2), Solid State (2), Laboratory (4).

**Chemistry IIIA:** Quantum chemistry (1), Spectroscopy (2), Mass Spectrometry (1), Diffraction methods (1), Statistical Mechanics (1), Laboratory (4).

**Applied Mathematics III:** Methods (6), Dynamics (2) Quantum Mechanics (4), Numerical Analysis (2).

Students who do not have the necessary prerequisites for some of these applied mathematics components may substitute others from either physics, chemistry, or in some instances Pure or Applied Mathematics II, provided the total of 36 credit points is maintained.

## FOURTH YEAR

Flexibility is a feature of the honours-year course. Chemical Physics IV has a nucleus which is common for all enrolled, and the remaining components may be chosen according to the particular interests of each student. Each of the lecture courses and the research project carries the same value (in terms of percentage of the total years' mark) as they represent in the overall courses of their respective department or division, and should be chosen so that the total course value is as close as possible to 100 per cent. The common components are:

**Physics IV:** statistical mechanics, quantum mechanics, scattering theory.

**Chemistry IV:** group theory, electronic spectroscopy, reaction theory.

## POSTGRADUATE STUDIES

Research programs leading to the degrees of M Sc or Ph D are available to holders of a good honours degree in chemical physics. Candidates of equivalent standing in related subjects may also be admitted. The divisions within the School co-operating in such programs are those of electron physics, physical chemistry, space physics, and in some instances applied mathematics. Degree requirements are similar to those existing in other areas of the School.

## CHEMISTRY

The three departments of chemistry combine to offer courses leading to the B Sc (pass) and B Sc (honours) degrees. In the academic year 1974, Chemistry I, Chemistry IIA and IIB, Chemistry IIIA and IIIB and Chemistry IV will be available.

Courses are intended to provide a thorough and balanced training in chemistry which will serve as a satisfactory prelude either to postgraduate research, further courses in allied subjects, industrial appointments, or a career in teaching, and are organized so that a student may major solely in chemistry; jointly in chemistry and another discipline from the School of Physical Sciences; or in chemistry and either biochemistry, botany, economics, genetics, philosophy or zoology.

Students intending to proceed to the honours degree in chemistry will be selected on the basis of their performance in the pass-degree course.

## CHEMISTRY I

**Prerequisites:** A student will normally be expected to have obtained a pass in chemistry at the higher school certificate examination or an approved equivalent, and to have reached at least leaving standard in physics and mathematics.

### Inorganic and Analytical Chemistry

**Syllabus:** Chemistry of the more important metallic and non-metallic elements with particular reference to the periodic classification of elements; the electronic structure of atoms; the principles of valency theory and chemical bonding; introduction to the chemistry of coordination compounds, valence bond, crystal and ligand field theories; analytical chemistry; nuclear and radiochemistry.

## Prescribed Books

Basolo, F., and Johnson, R.C. *Coordination Chemistry* Benjamin 1964  
Companion, A.L. *Chemical Bonding* McGraw-Hill 1964

## Recommended Books

Dickerson, R.E., Gray, H.B. and Haight, G.P. *Chemical Principles* W.A. Benjamin 1970  
Brescia, F., Arents, J., Meislech, H., and Turk, A. *Fundamentals of Chemistry* Academic Press 1970  
Heslop, R.B. and Wild, G.M. *S.I. Units in Chemistry: An Introduction* Applied Science 1971  
Christian, G.D. *Analytical Chemistry* Xerox 1971  
Newton, G.W.A., and Robinson, V.J. *Principles of Radiochemistry* Macmillan 1971  
Gray, H.B., *Electrons and Chemical Bonding* Benjamin 1965

## Organic Chemistry

**Syllabus:** Elementary organic chemistry, with particular reference to electronic theory and reaction mechanism; isomerism and stereochemistry; preparation and reaction of aliphatic and aromatic hydrocarbons, alcohols, halides, ethers, aldehydes, ketones, carboxylic acids and derivatives and amines.

## Prescribed Book

Davis, M., Deady, L.W. and Topsom, R.D. *Introductory Organic Chemistry* Longmans 1973

## Physical Chemistry

**Syllabus:** Thermodynamics, colligative properties; reaction kinetics; chemical equilibrium, ionic and heterogeneous equilibria in aqueous solutions; electrochemistry; properties of gases and kinetic theory; ions in solids, liquids and gases; atomic structure; bonding.

## Prescribed Book

Dickerson, R.E., Gray, H.B. and Haight, G.P. *Chemical Principles* W.A. Benjamin 1970

## Recommended Book

Aylward, G.H. and Findlay, T.J.V., *SI Chemical Data*, Wiley 1971  
**Practical:** The course includes the preparation and reactions of inorganic compounds; the preparation, purification, properties and reactions of

typical organic compounds, and experiments related to the physical chemistry lecture course.

All students are required to purchase an *Orbit Molecular Building System* model kit for use in practical courses and tutorials.

**Class Requirements:** Lectures — three a week for three terms. Tutorials and problem classes — as arranged. Practical — one 3-hour period a week throughout the three terms.

#### Examinations

Theory { Inorganic and Analytical — one 1½ hour written paper.  
Organic — one 1½ hour written paper.  
Physical — one 1½ hour written paper *per term component*.

The performance of each student in the practical laboratory courses is assessed throughout the year and taken into account in determining the success of the student at the annual examinations.

## CHEMISTRY IIA

**Prerequisites:** Chemistry I; and Physics I or a first-year mathematics unit. This course is intended for the student wishing to major in chemistry, and proceeding to the honours degree in chemistry, or those intending to specialize in physics, physics and chemistry, or chemistry and philosophy, jointly. The course is also suitable for students enrolled in the School of Biological Sciences.

### Inorganic and Analytical Chemistry

**Syllabus:** General and inorganic chemistry of the non-metallic elements; reactions in non-aqueous solvents; introduction to the inorganic solid state; hydrides of Groups V and VI; nuclear and radiochemistry; instrumental analysis.

#### Prescribed Books

MacKay, K.M., and MacKay, R.A. *Introduction to Modern Inorganic Chemistry* revised edn, Intertext 1972

Demitras, G.C., Russ, C.R. Salmon, J.F., Weber, J.H., Weiss, G.S. *Inorganic Chemistry* Prentice-Hall 1972

(For students proceeding to Chemistry III)

#### Recommended Books

Gould, E.S. *Inorganic Reactions and Structure* revised edn, Holt, Rinehart and Winston 1962

Duncan, J.F., and Cook, G.B. *Isotopes in Chemistry* Clarendon Press 1968



Ewing, G.W. *Instrumental Methods of Chemical Analysis* McGraw-Hill 3rd edn 1969

Cotton, F.A., and Wilkinson, G. *Advanced Inorganic Chemistry* 3rd edn, Interscience 1972

## Organic Chemistry

**Syllabus:** Physical organic chemistry; investigation of reaction mechanisms; aromatic substitution reactions; reaction intermediates; carbohydrates, amino acids, proteins, lipids; simple conformational analysis and optical activity.

### Prescribed Book

Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry* 3rd edn, McGraw-Hill, Int. Student Edn

### Recommended Book

Gould, E.S. *Mechanism and Structure in Organic Chemistry* Holt, Rinehart and Winston 1959

## Physical Chemistry

**Syllabus:** PC2.01 Bonding Theory, PC2.02 Spectroscopy, PC2.03 Thermodynamics, PC2.04 Reaction Kinetics. Students enrolled in the School of Biological Sciences may take PC2.05 Macromolecules, Colloids and Surface Chemistry instead of PC2.01, and PC2.06 Bioenergetics instead of PC2.03.

### Prescribed Book

Daniels, F., and Alberty, R.A., *Physical Chemistry* 3rd edn, John Wiley 1967

### Recommended Books

Aylward, G.H. and Findlay, T.J.V., *SI Chemical Data* Wiley 1971

Barrow, G.M. *Physical Chemistry* 3rd edn, McGraw-Hill 1973

Moore, W.J. *Physical Chemistry* 4th edn, Prentice-Hall 1962

Gray, H.B. *Electrons and Chemical Bonding* Benjamin 1965

Barrow, G.M. *The Structure of Molecules* Benjamin 1964

Laidler, K.J. *Reaction Kinetics* Vols. 1 and 2 Pergamon 1963

Salzberg, H.W., Morrow, J.I. and Cohen, S.R. *Laboratory Course in Physical Chemistry* Academic 1966.

**Practical:** The course will include inorganic preparations, reactions and techniques; advanced chemical and instrumental analysis; the preparation, purification, properties, identification and reactions of various organic compounds (emphasis will be placed on the use of modern physical and chemical techniques); a range of physical chemistry experiments, based on the second-year lecture course.

**Class Requirements:** Lectures – four a week for three terms. Tutorials – as arranged. Practical – a student taking Chemistry IIA will be required to work regularly in the laboratories for a minimum of four hours a week.

### Examinations

Theory { Inorganic and Analytical – One 2 hour written paper.  
Organic – Written papers throughout the year as required.  
Physical – One 1½ hour written paper per component.

The performance of each student in the practical laboratory course is assessed throughout the year and taken into account in determining the success of the student at the annual examination.

## CHEMISTRY IIB

This course is suitable for students who do not intend to take further courses in chemistry. Chemistry IIB is a terminal course.

**Prerequisite:** Chemistry I.

### Inorganic and Analytical Chemistry

**Syllabus:** The principal features and descriptive inorganic chemistry of selected non-metallic and metallic elements; coordination chemistry; modern methods of separation and analysis in inorganic chemistry; elementary chemical statistics; theory and practice of radiochemistry.

#### Prescribed Book

MacKay, K.M. and McKay, R.A. *Introduction to Modern Inorganic Chemistry* revised edn, Intertext 1972

#### Recommended Books

Gould, E.S. *Inorganic Reactions and Structure* revised edn, Holt, Rinehart and Winston 1962

Duncan, J.F. and Cook, G.B. *Isotopes in Chemistry* Clarendon Press 1968

Ewing, G.W. *Instrumental Methods of Chemical Analysis* 3rd edn, McGraw-Hill 1969

Cotton, F.A. and Wilkinson, G. *Advanced Inorganic Chemistry* 3rd edn Interscience 1972

### Organic Chemistry

**Syllabus:** Physical organic chemistry; carbohydrates, amino acids, proteins, simple conformational analysis, optical activity; bioorganic mechanisms; natural products, biosynthesis.

#### Prescribed Book

Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry* 3rd edn, McGraw-Hill, Int. Student Edn

## Physical Chemistry

**Syllabus:** PC2.02 Spectroscopy, PC2.04 Reaction Kinetics, PC2.05 Macromolecules, Colloids and Surface Chemistry, PC2.06 Bioenergetics. Students enrolled in the School of Agriculture take only PC2.02, PC2.04 and PC2.06.

### Prescribed Book

Daniels, F. and Alberty, R.A. *Physical Chemistry* 3rd edn, John Wiley 1967

### Recommended Books

Aylward, G.H. and Findlay, T.J.V., *SI Chemical Data* Wiley 1971

Barrow, G.M., *Physical Chemistry* 3rd edn, McGraw-Hill 1973

Moore, W.J., *Physical Chemistry* 4th edn, Prentice-Hall 1962

Laidler, K.J., *Reaction Kinetics* vols 1 and 2 Pergamon 1963

Barrow, G.M., *The Structure of Molecules* Benjamin 1964

Salzberg, H.W., Morrow, J.I., and Cohen, S.R., *Laboratory Course in Physical Chemistry* Academic Press 1966

**Practical:** The course will include inorganic preparations, reactions and techniques; advanced chemical and instrumental analysis; the preparation, purification, properties, identification and reactions of various organic compounds (emphasis will be placed on the use of modern physical and chemical techniques); a range of physical chemistry experiments based on the second-year lecture course (emphasis will be placed on the use of modern physical and analytical techniques and on applications of thermodynamics).

**Class Requirements:** A course of approximately 80 lectures. Tutorials – as arranged. Practical – a student taking Chemistry IIB will be required to work regularly in the laboratories for four hours a week.

### Examinations

Theory	{	Inorganic and Analytical – One 2 hour written paper.
		Organic – Written papers throughout the year as required.
		Physical – One 1½ hour written paper per component.

The performance of each student in the practical laboratory course is assessed through the year and taken into account in determining the success of the student at the annual examinations.

## CHEMISTRY COURSES FOR PHYSICAL SCIENCES II

The sections of the chemistry courses which may be taken in Physical Sciences II are: Inorganic Chemistry IIB, Organic Chemistry IIA or IIB, and Physical Chemistry IIA or IIB.

Each may be taken singly or in combination provided that chemistry is not taken as a major subject at the second-year level. The prerequisite for each is Chemistry I and each has a value of one third of a second-year unit.

### CHEMISTRY IIIA

This is a two-unit course intended for the student wishing to major in chemistry alone.

**Prerequisite:** Chemistry IIA.

#### Inorganic and Analytical Chemistry

**Syllabus:** Systematic inorganic chemistry; chemistry of lanthanons and actinons; general chemistry of the peroxy compounds of transition metals; hydrides with detailed treatment of boron hydrides; interhalogen compounds; poly-halides; experimental techniques in inorganic chemistry including NMR, ESR, Mossbauer, ORD, CD; inorganic stereochemistry and advanced ligand field theory; transition metal complexes with  $\pi$ -bonding; kinetics and mechanisms of reactions of coordination compounds; electrochemistry; thermochemistry, organo-metallic chemistry; statistics in chemistry; organic reagents in inorganic analysis; instrumental methods of analysis (this course deals with the theory and use of instruments of importance in inorganic and analytical chemistry, e.g. UV-visible spectrophotometry, infrared spectroscopy, atomic absorption spectrophotometry, thermogravimetry, polarography, etc).

#### Recommended Books

- Demitras, G.C., Russ, C.R., Salmon, J.F., Weber, J.H., Weiss, G.S. *Inorganic Chemistry* Prentice Hall 1972
- Basolo, F., and Pearson, R.G. *Mechanisms of Inorganic Reactions* Wiley 1967
- Pecsok, R.L. and Shields, L.D. *Modern Methods of Chemical Analysis* Wiley 1968
- Ewing, G.W. *Instrumental Methods of Chemical Analysis* McGraw-Hill 3rd edn 1969
- Angelici, R.J. *Synthesis and Techniques in Inorganic Chemistry* Saunders 1969

Browning, D.R. *Spectroscopy* McGraw-Hill 1969

Day, M.C., and Selbin J. *Theoretical Inorganic Chemistry* 2nd edn, Reinhold 1969

Cotton, F.A., and Wilkinson, G. *Advanced Inorganic Chemistry* 3rd edn, Interscience 1972

## Organic Chemistry

**Syllabus:** Theoretical organic chemistry and aromaticity; organic reaction mechanisms and orbital symmetry; IR and NMR spectroscopy; synthetic methods; heteroaromatic compounds; industrial organic chemistry; free radical chemistry and photochemistry.

Instruction will be given on searching the chemical literature and this will include a short project.

### Prescribed Book

Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry* 3rd edn, McGraw-Hill, Int. Student Edn

### Recommended Books

Woodward, R.B. and Hoffman, R. *The Conservation of Orbital Symmetry* Verlag Chemie 1970

Acheson, R.M. *An Introduction to the Chemistry of Heterocyclic Compounds* 2nd edn, Wiley 1967

Pryor, W.A. *Introduction to Free Radical Chemistry* Prentice Hall 1966

## Physical Chemistry

**Syllabus:** A total of at least six components, which must include PC3.00 Computing. Students who choose to complete more than six components will be assessed on their best six results. The remaining components to be chosen from PC3.01 Elementary Quantum Chemistry, PC3.02 Symmetry and Spectroscopy, PC3.03 Spectroscopy and Structure, PC3.04 Diffraction Methods, PC3.05 Mass Spectroscopy, PC3.06 Reaction Kinetics, PC3.07 Statistical Mechanics, PC3.08 Information Theory.

### Prescribed Book

McCracken, D.D. *A Guide to Fortran IV Programming* Wiley 1968

### Recommended Books

Daniels, F. and Alberty, R.A., *Physical Chemistry* 3rd edn, John Wiley 1967

Barrow, G.M. *Physical Chemistry* 3rd edn, McGraw-Hill 1973

Moore, W.J., *Physical Chemistry* 4th edn, Prentice-Hall 1962

Banwell, C.N., *Fundamentals of Molecular Spectroscopy*, McGraw-Hill 1966 (PC3.03)

- Dixon, R.N. *Spectroscopy and Structure* Methuen 1965 (PC3.02 and PC3.03)
- Davidson, G. *Introductory Group Theory for Chemists* Elsevier 1971 (PC3.01 and PC3.02)
- Laidler, K.J. *Chemical Kinetics* 2nd edn, McGraw-Hill 1965 (PC3.06)
- Johnstone, R.A.W. *Mass Spectrometry for Organic Chemists* Cambridge 1972 (PC3.05)
- Brillouin, C. *Science and Information Theory* 2nd edn, Academic 1962 (PC3.08)
- Levine, I.N. *Quantum Chemistry Vol. 1: Quantum Mechanics and Molecular Electronic Structure* Allyn and Bacon 1970 (PC3.01)
- Jackson, E.A. *Equilibrium Statistical Mechanics* Prentice-Hall 1968 (PC3.07)

**Practical:** Advanced inorganic, organic and physical chemistry, including preparations, analytical and special techniques. A student taking Chemistry IIIA will be required to work regularly in the laboratories for a minimum of 12 hours a week.

**Class Requirements:** Lectures – approximately seven a week for three terms. Tutorials/seminars – as arranged.

**Examinations:** The various sections of the Chemistry III course will be examined either during the year by projects or written papers, or at the end of the year by written papers. All inorganic and analytical examinations are held at the end of the academic year in November.

## CHEMISTRY IIIB

This one-unit course is intended for those students who wish to specialize in chemistry jointly with a second subject.

**Prerequisite:** Chemistry IIA.

### Inorganic and Analytical Chemistry

**Syllabus:** Systematic inorganic chemistry; chemistry of the lanthanons and actinons; general chemistry of peroxy compounds of transition metals; hydrides; experimental techniques in inorganic chemistry; inorganic stereochemistry and advanced ligand field theory; kinetics and mechanisms of reactions of coordination compounds; electrochemistry; thermochemistry; organic reagents in inorganic analysis; selection of instrumental methods of analysis.

## Organic Chemistry

**Syllabus:** Four courses from those listed for Chemistry IIIA (consult with Professor Topsom).

## Physical Chemistry

**Syllabus:** A total of at least three components chosen from those listed for Chemistry IIIA.

**Prescribed Books:** See Chemistry IIIA

**Recommended Books:** See Chemistry IIIA

**Practical:** Advanced inorganic, and organic and physical chemistry, including preparations, analytical and special techniques.

**Class Requirements:** Lectures – four a week for three terms. Tutorials – as arranged. Practical – a student taking Chemistry IIIB will be required to work regularly in the laboratories for a minimum of 6 hours a week.

**Examinations:** See Chemistry IIIA.

Tests on the theoretical background to the practical course and the theory will be held throughout the year as required.

The performance of each student in the practical laboratory courses is assessed throughout the year and taken into account in determining the success of the student at the annual examination.

## CHEMISTRY COURSES FOR PHYSICAL SCIENCES III

The segments of the chemistry courses which may be taken in Physical Sciences III are: Inorganic Chemistry IIIB, Organic Chemistry III, and Physical Chemistry III.

Each may be taken singly or in combination provided that chemistry is not being taken as a major subject at the third-year level. The prerequisite for each is the appropriate course from Chemistry IIA or IIB and each has a value of one third of a third-year unit.

Students should note that completion of sections of the chemistry course in Physical Sciences III does not qualify them for admission to the honours school of chemistry, but that Physical Chemistry III may qualify them for admission to Chemical Physics IV.

## CHEMISTRY IV – HONOURS COURSE

**Prerequisite:** Normally, a grade of at least C in Chemistry IIIA is required. Students who have performed well in Chemistry IIIB and another third-year subject may be admitted to the honours course.

**Syllabus:** The fourth-year course comprises more advanced study with lectures in all three branches: inorganic, organic, physical. All students are required to take nine units normally selected from the following list of courses, with the restriction that not less than one or more than five may be taken from those of any one group. Courses must be approved by the head of the department (Inorganic and Analytical, Organic, Physical) in which the student is undertaking the research project, and that marked with an asterisk (\*) is obligatory for students undertaking the research project in inorganic chemistry. Students may, with the approval of the appropriate departmental heads, also take courses offered by other departments such as biochemistry, geology, mathematics or physics.

On the experimental side, the value of training in research is recognized. There are no formal or set experiments, but each student is required at the beginning of the fourth-year course to opt for the branch of chemistry in which he wishes to undertake a research investigation. At the conclusion of the academic year, the student is required to write an original dissertation on the results of his work.

### **Inorganic and Analytical Chemistry**

**\*Theoretical and the Determination of Molecular Structure (1 unit):** Elements of symmetry and group theory. Absorption spectroscopy – atomic spectra, spectroscopic terms; advanced ligand field theory (effect of crystal fields on spectroscopic terms); Orgel diagrams, Tanabe-Sugano diagrams, correlation diagrams, selection rules, band intensities, etc. Theory of magnetism. Magnetic behaviour of inorganic substances; magnetic properties of free ions; effect of crystal fields – orbital contributions; variation with temperature. Applications of molecular orbital theory in inorganic chemistry. Electron spin resonance and infrared spectroscopy of inorganic species.

**Descriptive Inorganic Chemistry (1 unit):** Electron deficient compounds, polyacids, carbides, nitrides, borides, tungsten bronzes, metal-sulphur chemistry, silicates, silicones, graphite, inorganic polymers.

### **Modern Techniques in Inorganic Analytical Chemistry (2 units)**

1. Solvent extraction, theory and application.
2. Ion exchange, theory and application.
3. Atomic absorption spectroscopy.
4. Ion selective electrodes.
5. Gas chromatography of metal chelates.
6. Advanced electrochemical techniques.



**Radiation Chemistry (1 unit):** Introduction: radiation types and sources; radiolysis of water and aqueous solutions; radical and molecular products; radiation dosimetry — the Fricke dosimeter; determination of molecular and radical yields; radiation decomposition of gases; radiolysis of organic compounds; irradiation of polymers; uses of radiation chemistry.

**Chemistry and Society (1 unit):** Of considerable interest today in chemistry courses, is the need for relevance and indication of the great impact that chemistry has on our modern society. In this course, emphasis is placed on the application of chemistry and chemical principles to technology, ecology, the environment and the problems of society.

**Stereochemistry and Reaction Mechanisms (1 unit):** This course deals mainly with inter and intra-molecular rearrangements in transition and non-transition metal complex species. Topics include geometrical isomerism and equilibria in 4 and 6-coordinate species; reactions of optically active metal complexes (e.g. inversion, racemization) including a consideration of absolute configuration, conformational analysis stereoselective and stereospecific ligands and reactions.

**Instrumental Techniques in Inorganic Chemistry (1 unit):** 1. Thermodynamic techniques: (a) Capsule and titration calorimetry. 2. Spectroscopy techniques. (a) Mossbauer spectroscopy, (b) Nuclear quadrupole resonance spectroscopy.

**Metal Catalysis in Inorganic, Organic and Bio-chemistry (1 unit):** Factors contributing to the activity of metal catalysts. Electron transfer reactions. Catalytic activation of hydrogen and other saturated molecules. Hydrogenation, isomerisation, hydroformulation of olefins and acetylenes. Oligomerisation and polymerisation of olefins. Olefin disproportionation. Activation of carbon-carbon and carbon-hydrogen sigma bonds. Nitrogen fixation. Oxygen transport. Transport of ions through cell walls.

## Organic Chemistry

Details of courses are given in the Department brochure, available on application.

Theoretical Organic Chemistry

Physical Organic Chemistry

Organic Synthesis

NMR Spectroscopy

Heterocyclic Chemistry

The Chemistry of Drugs  
 Biosynthesis and Natural Product Chemistry  
 Aspects of Organometallic Chemistry.

### Physical Chemistry

**PC 4.01 Group Theory:** Elements of group theory, groups, symmetry in molecules, matrix representation of groups, character table. Applications of group theory in chemistry, molecular vibration, molecular orbitals, spectroscopic selection rules.

**PC 4.02 Electronic Spectroscopy:** Techniques in photoelectron spectroscopy; chemical shifts of core electron energies; molecular orbital energies and splittings; allowed vibrational progressions; photoelectron angular distributions; lifetimes of excited states.

**PC 4.03 ESR Spectroscopy:** Principles of magnetic resonance; experimental techniques; Solution spectra; trapped radicals in solids; organic molecules in triplet states; transition metal complexes; spin relaxation and rate processes; spin-labelling of biomolecules.

**PC 4.04 Crystallography:** Crystal symmetry; X-ray and neutron diffraction; diffraction theory; the phase problem; vector and Fourier methods; direct methods of structure determination; structures of large molecules; examples of crystal structure analysis.

**PC 4.05 Mass Spectrometry:** Energetics of ionization-dissociation processes; theory of mass spectra; special applications of mass spectrometry in organic and inorganic chemistry.

**PC 4.06 Reaction Rate Theory:** Kinetic Theory of Gases; unimolecular gas reactions at low and moderate pressures; quasi-equilibrium theory of mass spectral fragmentation; bimolecular gas reactions and Collision theory; classical trajectory calculations; empirical schemes for rate calculation; quantum mechanical effects.

**PC 4.07 Gas Kinetics:** Elementary radical reactions in the gas phase, theoretical estimation of rate parameters, kinetic isotope effects.

**PC 4.08 Chemical Information Theory:** The mathematical basis of information theory; experiments considered as a communication situation; noise, redundancy, coding; pattern recognition; Fourier transforms; deconvolution; chemical structure codes.

**Practical:** Each student is required to work on a research problem under the supervision of a member of staff of the department in a field of his own selection (inorganic, organic, physical, analytical). At the end of the

research investigation, each student is required to write and submit a dissertation.

**Class Requirements:** A feature of the honours course will be student seminars. All students are also expected to attend the departmental research colloquia.

**Examinations:** To be advised. Physical chemistry examinations will normally be held within a few weeks of completion of the relevant lecture courses. All inorganic and analytical examinations are held at the end of the academic year in November.

### **Prescribed and Recommended Reading**

**INORGANIC AND ANALYTICAL CHEMISTRY:** At the beginning of each lecture course, prescribed and recommended reading is advised by the lecturer concerned.

**ORGANIC CHEMISTRY:** Prescribed reading to be advised for enrolling students.

**PHYSICAL CHEMISTRY:** Prescribed reading to be advised for enrolling students.

### **HONOURS PRIZE**

The Society of Chemical Industry of Victoria awards an annual prize, \$25 and a certificate, to the top student in the chemistry honours year.

### **POSTGRADUATE STUDIES**

The department offers research programs leading to the degrees of M Sc or Ph D. For admission to candidature for the degree of Master of Science, applicants should normally have, or expect to receive the degree of Bachelor of Science with honours in chemistry from this or an accredited university. Students with high standing in general-degree courses, or who hold a diploma, certificate or qualification recognized and approved by the University as equivalent to a degree or a suitable alternative to a primary degree may be granted admission after attending a preliminary course and passing a preliminary examination.

Admission to candidature for the degree of Doctor of Philosophy may be granted to applicants who hold the degree of Master of Science from this or an accredited university, have high standing in the degree of bachelor with honours or hold the pass degree of bachelor and have passed a preliminary examination in this University for the degree of master not less than one academic year after having qualified for the pass degree of bachelor.

Both the M Sc and Ph D degrees require the submission of a thesis reporting the results of original research carried out under supervision. In certain cases, the department may be prepared to consider applications from candidates for admission to candidature for the degree of M Sc by examination. In certain circumstances, the degrees may be obtained by part-time research study.

Prospective candidates for the M Sc or Ph D degrees should write in the first instance to the professor of the department concerned for further information:

Professor R.J. Magee, Head, Department of Inorganic and Analytical Chemistry.

Professor R.D. Topsom, Head, Department of Organic Chemistry.

Professor J.D. Morrison, Head, Department of Physical Chemistry. Excellent facilities are available for research in a wide range of specialist fields:

### **Inorganic and Analytical Chemistry**

Preparative, spectroscopic (u.v.-visible, i.r., e.s.r., n.m.r.) and structural studies on metal chelates of transitional metals. Sulphur ligand complexes: metal xanthates, dithiocarbamates, thiocarbamates and related compounds. Electrochemistry: polarographic, cyclicvoltammetric and chronopotentiometric studies on inorganic systems. Solvent extraction studies using neutral and acidic alkyl phosphoric acid esters and high molecular weight amines. Radiation and radio-chemistry. Inorganic analytical chemistry. Magnetochemistry of inorganic species. Gas chromatography of metal chelates. Selective ion electrode studies. Thermochemical studies on coordination compounds: titration and capsule calorimetry. Inter and intra-molecular rearrangements of four and six-coordinate transition metal complexes in solution. Design of stereospecific ligands in four and six-coordinate metal complexes. Studies of metal complexes having biological significance. Studies of oxidation-reduction and acid-base reactions of transition metal compounds in molten salts -- nitrates, nitrites and acetates of alkali metals. Synthetic and catalytic chemistry of transition metal ions. Stabilization of unstable species by transition elements. Molecular nitrogen compounds. Development of the use of contact shift measurements in rapidly exchanging systems to determine coordination structures in solution. The use of pressure to probe mechanisms of inorganic reactions.

### **Organic Chemistry**

Physical organic chemistry including effects of steric and electronic factors on the reactivity and properties of aromatic and heteroaromatic

## ECONOMICS

compounds; theoretical and spectroscopic studies on molecular structure of organic compounds; infrared intensity studies; mechanisms of aromatic and heterocyclic reactions; solvent effects on reaction mechanisms; synthesis, reactivity and stereochemistry of aromatic molecules; chemistry of naturally occurring compounds; synthesis and properties of polycyclic hydrocarbons; mechanism of drug activity; studies in water pollution.

### Physical Chemistry

Self-consistent-field LCAOMO calculations on molecules containing atoms from the second and third rows of the periodic table. The role of 3d-orbitals in bonding. Localized molecular orbitals.

Single crystal structural studies by X-ray and neutron diffraction.

Geochemical studies of minerals using standard and flameless atomic absorption, X-ray fluorescence, spectrographic, mass spectrometric and other analytical techniques.

Kinetics of elementary radical reactions in the gas phase. Recombination of small alkyl and substituted alkyl radicals studied by the rotating sector technique; hydrogen abstraction reactions of small radicals and isotope effects in such reactions.

Molecular dynamics and energetics studies by magnetic relaxation behaviour and the photoejection of electrons. Photoelectron energies and angular distributions of small molecules in absorbed and gaseous phases.

The study of the upper energy states of molecules and the ionization-dissociation processes induced by photon and electron impact in the mass spectrometer.

The application of the computer-controlled GLC mass spectrometer to the study of complex organic mixtures such as odors and flavors. Development of computer programs for ab-initio structure determination from the mass spectra. The design of mass spectrometers.

Isotope ratio measurements of oxygen and sulphur. Paleotemperature studies.

Air and water pollution studies of the Victorian environment.

## ECONOMICS

For details see Part I of the Handbook containing disciplines offered by the School of Social Sciences.

## EDUCATION

For details see Part I of the Handbook containing subjects offered by the School of Education.

## GENETICS

### GENETICS II

A general course based on the genetical and evolutionary section of Biology IA and IB. It is divided into six units of equal length:

1. Analytical genetics
2. Introductory cytogenetics
3. Population and quantitative genetics
4. Human biology
5. Biochemical genetics
6. Microbial genetics

The course is both complete in itself, and serves as an introduction to Genetics III, since it covers all the major areas of genetics and related disciplines at a higher level than in Biology IA and IB. Disciplines which are recommended to be taken with Genetics II, include mathematics, statistics, biochemistry, botany and zoology.

A formal examination will be held following the completion of the first two units of the course. It is possible that a second examination may be held during the later part of the course.

#### Prerequisites

1. Biology IA and IB, but in special circumstances one of these subjects is sufficient.
2. A minimum of one of Chemistry I, Physics I, and a branch of first-year mathematics.

#### Recommended Reading

- Srb, A.M., Owen, R.D., and Edgar, R.S. *General Genetics* 2nd edn, Freeman 1965
- Harrison, G.A., Weiner, J.S., Tanner, J.M. and Barnicot, N.A. *Human Biology: An Introduction to Human Evolution, Variation and Growth* Clarendon Press, Oxford 1964

#### Recommended References

- Balaam, L.N. *Fundamentals of Biometry* George Allen and Unwin 1972
- Bishop, O.N. *Statistics for Biology* 2nd edn, Longman 1971

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- Davis, B.D., Dulbecco, R., Ginsberg, H.S. Eisen, H.N. and Wood, W.B. *Principles of Microbiology and Immunology* Harper and Row 1968
- Falconer, D.S. *Introduction to Quantitative Genetics* Oliver and Boyd 1960
- Hayes, W. *The Genetics of Bacteria and their Viruses* 2nd edn, Blackwell 1968
- Mather, K. and Jinks, J.L. *Biomedical Genetics* Chapman and Hall 1971
- Mettler, L.E. and Gregg, T.G. *Population Genetics and Evolution* Prentice Hall 1969
- Parsons, P.A. *The Genetic Analysis of Behaviour* Methuen 1967
- Stent, G. *Molecular Genetics* Freeman 1971
- Whitehouse, H.K.L. *Towards an Understanding of the Mechanism of Heredity* 2nd edn, Edward Arnold 1969

## GENETICS III

An advanced course based on Genetics II as a prerequisite. The course will consist of: microbial, molecular, and developmental genetics (40 lectures); behavioural, ecological, quantitative, and population genetics (40 lectures); recombination or the genetic basis of behaviour (20 lectures).

### Recommended Reading

- Du Praw, E.J. *DNA and Chromosomes* Holt, Rinehart and Winston 1970
- Markert, C.L. and Ursprung, H. *Developmental Genetics* Prentice Hall 1971
- Parsons, P.A. *Behavioural and Ecological Genetics: a Study in Drosophila* Oxford 1973
- Watson, J.D. *Molecular Biology of the Gene* 2nd edn, Benjamin 1970

### Recommended References

- Du Praw, E.J. *Cell and Molecular Biology* Academic Press 1968
- Falconer, D.S. *Introduction to Quantitative Genetics* Oliver and Boyd 1960
- Hayes, W. *The Genetics of Bacteria and their Viruses* 2nd edn, Blackwell 1968
- Lawrence, C.W. *Cellular Radiobiology* Arnold 1971
- Mather, K. and Jinks, J.L. *Biometrical Genetics* Chapman and Hall 1971
- Mettler, L.E. and Gregg, T.G. *Population Genetics and Evolution* Prentice Hall 1969
- Wallace, B. *Topics in Population Genetics* Norton 1968

## HONOURS

The course will consist of a special research project, essays, prescribed reading courses, and such other work as may be required by the chairman of the department. Graduates from other universities will be admitted if

they are of adequate standard. Students intending to do honours should consult the chairman of the department.

## POSTGRADUATE STUDIES

### M Sc and Ph D (by research)

Prospective candidates should consult the chairman of the department for further details. Research is currently in progress in the following fields:

1. Behavioural, ecological and physiological genetics of *Drosophila* and mice.
2. Quantitative genetics of *Drosophila* and man.
3. Biochemical genetics of *Drosophila*.
4. Population genetic studies with Australian native plants and cytogenetics of grasshoppers.
5. Radiobiology and radiation genetics in *Drosophila*, grasshoppers and bacteria.
6. Physical anthropology of Australian Aborigines, and human variation in local and Aboriginal populations.
7. Microbial genetics (bacteria and fungi).
8. Development genetics.

### M Sc (by examination in Applied Genetics)

A course in applied genetics will be offered for those with an honours degree or its equivalent in science, agriculture or medicine. The purpose of the course is to provide training in one or more of the following fields from the applied point of view:

1. Animal and plant breeding.
2. Human genetics and physical anthropology.
3. Microbial genetics.
4. Radiobiology.

The course consists of advanced lectures, essays, and prescribed reading in one or more of the above topics, together with a small project, and such other work as may be required by the chairman of the department. In the case of candidates with a background deficient in genetics, preliminary reading will be prescribed by the chairman of the department. The duration of the course is normally 10 months.

Those interested in the above course will be considered for 1974, but it is possible that not all of the above fields will be available in 1974. Intending candidates should consult the chairman of the department.



## GEOLOGY

For 20 years Australia has had a succession of mineral 'booms'. The last one not only led to an extraordinary demand for trained geologists but it also showed that all Australians need to have an elementary knowledge of geology. The need for geology as a cultural subject is highlighted by the estimate that Australia's export earnings for 1980 from minerals and mineral products alone will exceed the record total export earnings for 1971-1972 (\$1289 million). Apart from economic aspects geology provides an understanding of the environment in which we live.

Geology draws heavily on other branches of science and hence the aim of the La Trobe geology department is to provide courses that give a fundamental grounding in geology as well as allowing sufficient time in the undergraduate years for a student to obtain a sound grasp of science in general. Students intending to graduate in geology will normally take one of physics, chemistry or mathematics as well as geology to the third-year level.

The geology department offers courses leading to the B Sc (pass) and B Sc (honours) degrees within the School of Physical Sciences. Teaching at the first-year level began in 1972. Second year was added in 1973. In 1974 third-year courses will be given for the first time.

Applications will be considered from suitably qualified students wishing to take postgraduate studies leading to the M Sc and Ph D degrees.

### GEOLOGY I

**Prerequisites:** Students will normally be expected to have obtained a pass in either chemistry or physics at the higher school certificate or an approved equivalent. No previous knowledge of geology is assumed.

#### Syllabus

1. *Earth Materials and their Relationships.* Crystals; minerals; rocks of various types; economic mineral deposits. Deformation of rocks – faults, folds and other structures.
2. *Earth Processes.* The concept of geologic time; fossils and stratigraphy. Plate theory, the formation of mountains and 'continental drift'.

**Class Requirements:** Three lectures, and one 3-hour practical period a week for three terms. Attendance at field classes held on occasional Saturdays or Sundays during the session forms an essential part of the course: these are given in lieu of tutorial classes.

#### Prescribed Reading

Verhoogen, J., Turner, F.J., Weiss, L., Wahrhaftig, C. and Fyfe, W.S. *The Earth: an introduction to Physical Geology* Holt, Rinehart and Winston

Dana, E.S. (Hurlbut) *Manual of Mineralogy* Wiley (Paperback)

### Reference Books

The following books are referred to in lectures from time to time:  
Badgley, P.C. (1959) *Structural Methods for the Exploration Geologist*, Harper

Clark, S.P. (1971) *Structure of the Earth* Prentice-Hall (Paperback)

Eicher, D.L. (1968) *Geologic Time* Prentice-Hall (Paperback)

Gass, I.G., Smith, P.J. and Wilson, R.C.L. (Editors) 1971 *Understanding the Earth* Artimis Press (Paperback)

Garrels, R.M. and MacKenzie, F.T. 1971 *Evolution of Sedimentary Rocks* Norton

Hills, E.S. (1972) *Elements of Structural Geology* 2nd edn, Science (Paperback)

Pettijohn, F.J. (1957) *Sedimentary Rocks* 2nd edn, Harper

Phillips, F.C. (1954) *The Use of Stereographic Projection in Structural Geology* Arnold

Stacey, F.D. (1969) *Physics of the Earth* Wiley

Wedepohl, K.H. (1971) *Geochemistry* Holt, Rinehart and Winston

Wilson, J.T. (ed.) (1971) *Continents Adrift Readings from Scientific American*, Freeman (Paperback)

## GEOLOGY II

**Prerequisites:** Geology I is normally required. Students taking the Crystal Optics part of the course only, should have passed in either Geology I, Physics I or Chemistry I. The four courses listed below, together constitute a full course in Geology II: all are required by those students wishing to proceed to third year.

### CRYSTAL OPTICS (3 Credit Points)

#### Syllabus

Polarized light; isotropic and anisotropic media, the polarizing microscope; refractive index measurement by immersion and mineral identification; interference of light; the uniaxial and biaxial indicatrix; orthoscopic and conoscopic examination of uniaxial and biaxial crystals; interference figures. Practical applications of optical crystallography, particularly in mineralogy.

#### Prescribed Reading

Bloss, D.F. (1961) *An Introduction to the methods of Optical Crystallography* Holt, Rinehart and Winston

Deer, W.A., Howie, R.A. and Zussman, J. (1966) *An Introduction to Rock Forming Minerals* Longmans Green

## IGNEOUS PETROLOGY (3 Credit Points)

### Syllabus

A study of those rocks formed from silicate melts with particular reference to their chemical composition and mineral phase relationships. Classification of rocks according to their occurrence in space and time; phase equilibrium of silicate melts; optical study of igneous rocks in thin section; ore deposits of igneous origin; structural relationships of igneous rocks.

### Prescribed Reading

Joplin, G.A. (1971) *A Petrography of Australian Igneous Rocks* Angus and Robertson

## METAMORPHIC PETROLOGY (3 Credit Points)

### Syllabus

A study of those rocks that have crystallized or recrystallized in the solid state. Discussions of the thermal, baric and chemical parameters affecting metamorphic rocks; graphical analysis; subsolidus phase relations. Metamorphism in space and time. The geological sources of heat, pressure, etc. The optical study of suites of metamorphic rocks from worldwide, well studied regional, contact and metasomatic environments. The spatial investigation of particular metamorphic terrains in Southern Australia (two field trips) with the optical study of collected samples. Ore deposits associated with metamorphic rocks.

### Prescribed Reading

Turner, F.J. (1968) *Metamorphic Petrology* McGraw-Hill

Joplin, G.A. (1967) *A Petrography of Australian Metamorphic Rocks* Angus and Robertson

Sobolev, V.S. ed. *The Facies of Metamorphism*

## SEDIMENTOLOGY (3 Credit Points)

### Syllabus

Sedimentology will concentrate on the application of computers and statistics to the analysis of sedimentary basins. The FORTRAN IV programming language will be taught and time will be given to writing and running computer programs to solve geologic problems. Practical sessions will be devoted to optical studies of sedimentary rocks and the analysis of data collected on two field trips.

### Prescribed Reading

Harbaugh, J.W. and Merriam, D.F. (1968) *Computer applications in stratigraphic analysis* Wiley

**Reference Books**

- Bevington, P.R. (1969) *Data Reduction and Error Analysis for the Physical Sciences* McGraw-Hill
- Ernst, W. (1970) *Geochemical Facies Analysis* Elsevier
- Krumbein, W.C. and Graybill, F.A. (1965) *An Introduction to Statistical Models in Geology* McGraw-Hill
- Pettijohn, F.J. (1957) *Sedimentary Rocks* 2nd edn, Harper

**Class Requirements**

A total of eight hours formal teaching is required. Two lectures and two 3-hour sessions have been timetabled so that the three-hour session may be used for either lectures or practicals. A field excursion will be scheduled for a five-day period during the August vacation.

**Examinations**

Two 3-hour examinations and assessment of laboratory and fieldwork.

**GEOLOGY III**

**Prerequisite:** Geology II.

**FIELD GEOLOGY (5 Credit Points)****Syllabus**

Air-photo interpretation, photogrammetry and cartography. Preparation of thin and polished sections. X-ray diffraction analysis. Each student will be allocated a field mapping problem by a staff supervisor at the beginning of the academic year and will be expected to submit a map and report before 1 November.

**Assessment**

There will be no formal examination. Marks will be allotted for reliability of the field map, geologic interpretation and the draft report. A final mark for the field report and map.

**EXPERIMENTAL PETROLOGY (2 Credit Points)****Syllabus**

A review of the aims of experimental techniques, pH and activity metres, gas and solid buffering techniques of gas fugacities, pH and other ion activities. Discussion of the cold-seal, piston-cylinder, internally heated, anvil, and gas mixing apparatus, crystal growing techniques. Practical sessions will include the use of cold and hot-seal high temperature-high pressure apparatus.

## Reference Books

Ulmer, G.C. *Research Techniques for High Pressure and High Temperature* Springer (1971)

Alberson (1957) *Researches in Geochemistry II* John Wiley & Co

## IGNEOUS PETROGENESIS (2 Credit Points)

### Syllabus

Theoretical igneous petrology with particular reference to experimentation. Phase relationships of silica minerals, feldspars, olivines and pyroxenes, etc. Simple condensed systems and the origin of magmas in the crust. High pressure studies and magma generation in the mantle.

### Reference Books

Wyllie, P.J. (1971) *The Dynamic Earth: Textbook in Geosciences* (especially Chapter 8). Wiley

Bowen, N.L. (1956) *Evolution of the Igneous Rocks* Dover (paperback)

## SOLUTION GEOCHEMISTRY (6 Credit Points)

### Syllabus

The interaction of solids and solutions in sedimentary, hydrothermal and metamorphic environments. Solubilities of minerals, the calculation of activity – composition – temperature diagrams, graphical analysis, review of pertinent existing experimental work affecting the formation of carbonates, silicates, and sulphides, weathering. The study of well documented samples of fluid inclusions in minerals and drilled hydrothermal systems, hydrothermal steam generation, solution geochemistry and the formation of vein and skarn type mineral deposits, organically and inorganically derived sedimentary ore deposits. The solution geochemistry of oceans, rivers, and groundwaters.

### Reference Books

Barnes, H.L. ed. (1967) *Geochemistry of Hydrothermal Ore Deposits* Holt, Rinehart and Winston

Garrels, R.M. and Christ, C.L. (1965) *Solution, Minerals and Equilibria* Harper and Rowe

Garrels, R.M. and Christ, C.L. (1971) *Evolution of Sedimentary Rocks* Norton

Helgeson, H.C. (1967) *Solution, Chemistry and Metamorphism* (in *Researches Geochemistry*, v. 2, P.H. Abelson ed. John Wiley & Son

Krauskopf, K.B. *Introduction to Geochemistry* McGraw-Hill (1967)

**ISOTOPE GEOLOGY (3 Credit Points)****Syllabus**

Use of isotopes as tracers of geological processes and as sources of quantitative information via geochronology and geothermometry. Theory of the Rb-Sr, U-Pb and K-Ar decay schemes. Critical interpretation of geochronological results detailed for the Rb-Sr system. Isotopic evolution of Sr and Pb throughout earth's history: meteorites and the age of the earth; chemical differentiation within the earth; isotopic parameters of modern igneous rocks, their bearing on petrogenetic theory and relevance to global tectonics. Stable isotope systems; oxygen as a tracer and geothermometer.

**Reference Books**

- Hamilton, E.I. and Farquhar, R.M. (1968) *Radiometric Data for Geologists* Interscience  
 Barnes, H.L. (1967) *Geochemistry of Hydrothermal Ore Deposits* Holt, Rinehart and Winston

**Class Requirements**

A total of 10 formal teaching hours per week including at least six hours of practical work.

**Examinations**

Field geology will be examined by assessment of field mapping and reports. Other courses will either be examined during the year or at the end of the year by written papers or both.

**GEOLOGY IV (Honours)**

**Prerequisites:** A student enrolling in honours geology must have completed all requirements for an ordinary degree including Geology III. Admission is at the discretion of the department.

**COURSEWORK (10 Credit Points)**

Courses in igneous petrology, metamorphic petrology, sedimentology and ore genesis will be available in 1974. Other courses will be added in future years. Some students will be required to take courses in other departments. Course work including seminars will be assigned by a course supervisor nominated by the chairman.

**PROJECT (10 Credit Points)**

A research project on some simple geological problem is required. The project will be selected by a course supervisor in conjunction with the student.

## **MATHEMATICS**

### **Examinations**

Three 3-hour written papers or equivalent term papers will be given to examine course work. The project will be examined by a thesis and oral.

## **PHYSICAL SCIENCES II**

### **GEOLOGY**

Crystal Optics (3 credit points) may be taken by itself *or* Crystal Optics together with Igneous Petrology or Metamorphic Petrology or Sedimentology may be taken for 6 credit points.

## **PHYSICAL SCIENCES III**

### **GEOLOGY**

Geology II is recommended as a prerequisite for any course taken from those listed for Geology III but this will not be enforced. Field Geology is only available to those students taking a full course so that the following will be available to those students taking physical Sciences III:

Isotope geology (3 credit points)

Solution geochemistry (6 credit points)

Igneous petrogenesis (2 credit points)

Experimental petrology (2 credit points)

## **MATHEMATICS**

A student who wishes to major in mathematics may do so in any one of the Schools of Humanities, Physical Sciences and Social Sciences. Which School such a student will seek to enter depends partly upon his preferences so far as supporting subjects (and possible alternative majors) are concerned. He will also need to take into account the way the different regulations of these Schools affect the choice and flexibility of the mathematics subjects he may wish to choose.

Subjects available in 1974 are Mathematics IA, IB and IC, Pure Mathematics II, III and IV, Applied Mathematics II, III and IV, Mathematical Statistics II, III and IV and Computer Science III. There are three mathematics departments, namely Pure Mathematics, Applied Mathematics and Mathematical Statistics. In most cases a subject is taught by one of these departments, while in some cases two or three departments share the teaching.

Students enrolled in the School of Physical Sciences who wish to take a unit in mathematics, are required to take Mathematics IA and/or Mathematics IB. Mathematics IC is a terminal course and is incompatible with both Mathematics IA and Mathematics IB.

The main feature of mathematics subjects at second and third-year level is the choice allowed each student in planning his syllabus. This is achieved by dividing each subject into a number of components: students are allowed some degree of freedom in choosing their components, in taking some third-year components in second year and vice-versa, and in taking some of their components outside the subject in which they are formally enrolled. The choice is necessarily restricted in second year, where many components are compulsory, but a wider choice will be available in third year.

Students wishing to obtain an honours degree in mathematics must complete one of the subjects Pure Mathematics IV, Applied Mathematics IV or Mathematical Statistics IV. In addition to course work and examinations in these subjects each student must write a thesis, the assessment of which will count towards his final result.

## FIRST-YEAR SUBJECTS

### Mathematics IA, IB and IC

The subjects offered in first year are Mathematics IA, Mathematics IB and Mathematics IC. Mathematics IC is a terminal course and is incompatible with both Mathematics IA and Mathematics IB. Students intending to take second and third-year mathematics subjects should consult the subject prerequisites. Students intending to major in any mathematics subject are advised to take both Mathematics IA and IB.

**Mathematics IA** does not specialize in any branch of mathematics. It provides basic techniques of calculus and algebra used in the physical, biological and social sciences, and at the same time aims at giving students an understanding of the underlying mathematical ideas.

**Mathematics IB** has been revised, and from 1974 will be devoted to applicable mathematics, emphasizing the methods, models and approximations useful in the sciences (including biological and social sciences). The course will aim at the progressive development of ideas, methods and techniques.

**Mathematics IC** is designed principally to meet the requirements of students in the Schools of Behavioural Sciences, Biological Sciences and Social Sciences who have done little or no mathematics at the higher



school certificate examination. It may also be useful to those seeking a general introductory course in mathematics.

Students who have passed two of the higher school certificate examinations in pure mathematics, applied mathematics or general mathematics, or who have passed one of them with a grade of C or higher, should enrol in Mathematics IA and/or Mathematics IB rather than Mathematics IC.

In special circumstances and with the permission of the relevant chairmen, it may be possible for a student in the School of Physical Sciences to combine parts of Mathematics IA and Mathematics IB to count as one unit.

Students should note that Physical Sciences IT is available to students not in the School of Physical Sciences.

**Prerequisites:** While there are no formal prerequisites for any first-year mathematics subject, students are warned that the level of subjects in mathematics is determined under the assumption that:

1. Each student enrolled in mathematics IA has passed the higher school certificate examination in pure mathematics or applied mathematics or general mathematics.
2. Each student enrolled in Mathematics IB has passed the higher school certificate examination in pure mathematics or applied mathematics.
3. Each student enrolled in Mathematics IC has a good knowledge of calculus at fifth-form level.

Students in the School of Physical Sciences must take Mathematics IA and/or Mathematics IB rather than Mathematics IC.

### **Prerequisites for second and third years**

Students intending to take second-year mathematics subjects should note:

- (a) Mathematics IA is normally a prerequisite for Pure mathematics II and Mathematical Statistics II.
- (b) Mathematics IB is normally a prerequisite for Applied Mathematics II, while Mathematics IA is a prerequisite for Applied Mathematics III.

Students intending to take Mathematical Statistics III should note that it is strongly recommended that they take Pure Mathematics II.

Students intending to do Applied Mathematics III are required to take the Pure Mathematics components PM201, PM202 and PM203 in addition to Applied Mathematics II. Such students are strongly advised to take Pure Mathematics II as a second-year subject.

Students intending to take Computer Science III should note that it is recommended that they take the component M102, which is a part of Mathematics IB.

In special cases prerequisites may be waived by the chairman of the appropriate mathematics department.

### **Mathematics IA Syllabus**

Calculus, including limits and continuity, elementary functions, differentiation and integration techniques, polynomial approximation, linear differential equations, selected applications. Vector algebra. Logic, sets, functions. Number systems, including complex number techniques. Groups. Matrices, determinants, eigenvalues and eigenvectors. Probability.

Printed notes and programmed instruction manuals will be supplied.

### **Mathematics IB Syllabus**

The course consists of the following three components.

**M101 Mathematical Methods:** Analytic geometry, integration techniques, differential equations, mathematical models (with applications in physical, biological and social sciences).

**M102 Numerical Methods:** Introduction to computers and numerical analysis.

**M103 Mechanics:** Statics and dynamics of particles and rigid bodies.

### **Mathematics IC Syllabus**

Topics in finite mathematics, linear algebra, elementary programming, and some systematic calculus. Ideas and methods of mathematical statistics and the interpretation and design of experimental techniques.

**Class Requirements in each Subject:** A total of five class hours a week (including tutorials). Regular written exercises.

**Examination requirements and assessment in each Subject:** Six hours of written examinations. The results of written exercises and tests given during the year will be taken into account in the final assessment.

## **SECOND-YEAR SUBJECTS**

### **Pure Mathematics II, Applied Mathematics II and Mathematical Statistics II**

Three mathematics subjects are offered at the second-year level, namely Pure Mathematics II, Applied Mathematics II and Mathematical Statistics II. The lecture course in each subject is divided up into a number of components, each with a value expressed in terms of credit points, and students are allowed some measure of freedom in their choice of components. Subject to the restrictions listed below, a student taking one

mathematics subject must select components totalling at least 12 credit points, for two mathematics subjects at least 24 credit points, and for three mathematics subjects at least 36 credit points. The restrictions applying in the various subjects are:

**Pure Mathematics II:** Components PM201, PM203 and PM204 are compulsory. PM202 is a prerequisite for Pure Mathematics III.

**Applied Mathematics II:** Components AM201, AM202, AM203 are compulsory. AM204 is normally a prerequisite for Applied Mathematics III.

**Mathematical Statistics II:** Components ST201 and ST202 are compulsory. ST203 is a prerequisite for Mathematical Statistics III.

To exemplify the above rules, the following is an allowable selection of components for a student enrolled in Pure Mathematics II: PM201, PM202, PM203, PM204, AM202, ST206.

Advisers will be available within the mathematics departments at times to be arranged to assist students in making their choice of components.

Students should note that the subject Physical Sciences II is available. A student enrolled in this subject may select various second-year mathematics components to make up some or all of his workload in this subject.

**Prerequisites:** These are shown in the following table. In each case the appropriate prerequisite must be passed at a standard determined by the chairman of the appropriate mathematics department. Students will be notified with their examination results if they have not reached this standard.

<i>Subject</i>	<i>Prerequisite</i>
Applied Mathematics II	Mathematics IB
Pure Mathematics II	In 1974, Mathematics IB; after 1974, Mathematics IA
Mathematical Statistics II	Mathematics IA

In addition to the subject prerequisites given above, note that each of the components listed below has its own prerequisites. These may be either a first-year subject or another second-year component or both.

In special cases prerequisites may be waived by the chairman of the appropriate mathematics department.

Students intending to take third-year subjects should consult the prerequisites for those subjects and the relevant components before choosing their second-year components. Students intending to take Applied Mathematics III must pass PM201, PM202 and PM203. Students intending to take Mathematical Statistics III should take Mathematical Statistics II and are strongly recommended to take Pure Mathematics II

also. Students intending to take Computer Science III are recommended to take AM205.

Students intending to take final honours in mathematics must pass the subject Pure Mathematics II, and should also consult the prerequisites for final honours-year components.

**Preliminary and Prescribed Reading:** A list of books for preliminary and prescribed reading will be handed out to all students at the end of 1973. Further prescribed reading in various components may be given during the lectures in these components.

### COMPONENTS AVAILABLE

The components available for 1974 are listed below. Each department may cancel any component in which insufficient interest is shown, or may offer further components. The letters in the code indicate whether the component is taught by the department of pure mathematics (PM), applied mathematics (AM), or mathematical statistics (ST).

The components in pure mathematics are normally offered as follows:

- Term 1: PM201 and PM203
- Term 2: PM202, PM204 and PM205
- Term 3: PM206, PM209 and PM210

PM208 is normally given in term 1 and the first three weeks of term 2.

**PM201 Analysis A** (two credit points) (Prerequisite: Mathematics IA)  
Foundations of elementary calculus: concepts of convergence of sequences, limits and continuity of real functions; basic limit theorems. Nested intervals, Cauchy sequences, global properties of continuous functions.

**PM202 Analysis B** (two credit points) (prerequisite: PM201)

The ideas of convergence and continuity, developed in the context of real numbers in Analysis A, are extended to become workable in the context of more general sets. This is done by introduction of metric spaces and topological spaces.

**PM203 Linear Algebra** (two credit points) (Prerequisite: Mathematics IA)  
Finite dimensional vector spaces. Linear transformations and matrices. The dual space. Characteristic and minimal polynomials. The primary decomposition theorem. Bilinear forms.

**PM204 Abstract Algebra A** (two credit points) (Prerequisite: In 1974, Mathematics IB or IBI; after 1974, Mathematics IA)

Introduction to groups and rings. Homomorphisms, normal subgroups and ideals, homomorphism theorems. Integral domains and fields. Congruences.

**PM205 Linear Programming** (two credit points) (Prerequisite: Mathematics IA)

Linear inequalities. Duality, Simplex computations. Matrix games.

**PM206 Abstract Algebra B** (two credit points) (Prerequisite: PM204).  
A continuation of PM204. Commutative rings, leading to field extensions.  
Ruler and compass constructions. Finite abelian groups.

**PM208 Formal Logic** (four credit points) (Prerequisite: Mathematics IA)  
(This component is identical with Philosophy IIFA/IIIFA).  
Introduction to truth-functional and quantificational logic. An examination  
of some fundamental concepts of logic.

**PM209 Introduction to Advanced Calculus** (two credit points) (Prerequisite:  
PM202)

Differentiation of maps between normed vector spaces, modern version of  
the chain rule.

Computational recipes in finite dimensional spaces: componentwise  
differentiability, partial derivatives, Jacobian matrices.

**PM210 Geometry** (two credit points) (Prerequisite: Mathematics IA)  
Some simple propositions on ordered geometry, namely affine and absolute  
geometries, are introduced.

**AM201 Mathematical Methods** (four credit points) (Prerequisite: In 1974  
Mathematics IA; after 1974, Mathematics IA or IB)

Complex variables. Summation of series. Difference equations. Partial  
differentiation. Maxima and minima. Improper integrals. Double integrals.  
Differential geometry. Eigenvalues of matrices. Grad, div and curl. Integral  
theorems. Applications.

**AM202 Ordinary Differential Equations** (two credit points) (Prerequisite:  
In 1974 Mathematics IA; after 1974, Mathematics IA or IB)

Standard methods of integration of differential equations. Theory,  
methods of solution and applications of linear differential equations.  
Special functions.

**AM203 Partial Differential Equations** (two credit points) (Prerequisite:  
Mathematics IB, AM202)

First and second order partial differential equations. Classification  
methods of solution. Fourier series. Equations arising in physical,  
biological and social sciences.

**AM204 Mechanics** (four credit points) (Prerequisite: Mathematics IB)  
Vectorial mechanics. Analytical mechanics. Lagrange's equations. Small  
oscillations.

**AM205 Numerical Analysis and Computing A** (two credit points)  
(Prerequisite: Mathematics IB)

Elementary error analysis. Iterative methods. Solution of systems of linear equations and ordinary differential equations. Introductory computer programming: Fortran IV.

**AM206 Wave Propagation** (two credit points) (Prerequisite: AM203)  
Vibrating systems. Propagation in continuous media. Reflection and transmission. Dispersion. Wave packets.

**AM207 Numerical Analysis and Computing B** (two credit points)  
(Prerequisite: AM205). Available after 1974.

**ST201 Introduction to Probability Theory** (three credit points)  
(Prerequisite: Mathematics IA or IB)

Sample spaces, events, probability, random variables, distribution and density functions. Moments, expectations, special distributions, central limit theorem.

**ST202 Introduction to Statistics** (three credit points) (Prerequisite: ST201)  
Application of the results of ST201 to problems of statistical inference; in particular chi-squared, t and F tests.

**ST203 Correlation and Regression** (three credit points) (Prerequisite: ST202)

The relationship between two or three random variables. The relationship between a random variable and one or more independent variates. An introduction to the analysis of variance.

**ST204 Design and Analysis of Experiments** (one credit point) (Prerequisite: ST203)

The design of experiments and associated analyses of variance.

**ST205 Applied Regression** (one credit point) (Prerequisite: ST203)  
Selected topics in applied regression. Response-surface analysis, discriminant functions, non-linear regression models, comparison of predictor variables. Choice of designs.

**ST206 Sampling Theory** (two credit points) (Odd-numbered years only)  
(Prerequisite: Mathematics IA or IB)

Methods of analysis of sample surveys; simple random sampling; cluster sampling; stratified sampling.

**ST207 Applied Probability Models** (three credit points) (Prerequisite: Mathematics IA or IB)

Generating functions and applications. Random walks. Markov chains in discrete and continuous time. Applications of probability models in the biological, physical and social sciences.

**ST208 Mathematical Genetics** (one credit point) (Prerequisite: Mathematics IA or IB)

Application of mathematical models to Mendelian inheritance.

**Class Requirements:** Lectures – about nine for each credit point. Tutorials or practice classes as arranged for each component. Regular written exercises in each component.

**Examination Requirements:** About three 3-hour written papers in each subject. The number may vary according to the components chosen. Shorter papers may be set in some components. The final result will take into account exercises and tests held throughout the year.

## THIRD-YEAR SUBJECTS

**Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III, Computer Science III**

Four mathematics subjects are offered at the third-year level, namely Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III and Computer Science III. A component system similar to that operating for second-year subjects will apply. Subject to the restrictions listed below, a student taking one mathematics subject must select mathematics components totalling at least 18 credit points and for two subjects at least 36. It may be possible in certain cases for students to select a small number of second-year components instead of third-year components.

Advisers will be available within the mathematics departments at times to be arranged to assist students in making their choice of components.

A student must take at least 12 credit points from the subject in which he is enrolled, and may make up the remainder from any third-year mathematics subject, except that a Computer Science III student may also select from the physics components PH201 (1 credit point), PH302 (1 credit point) and from the physical chemistry component PC3.08 (1 credit point). Furthermore, AM301 is compulsory for Applied Mathematics III, ST301 and ST302 are compulsory for Mathematical Statistics III, and CS301, CS302, CS303 and CS304 are compulsory for Computer Science III. At most, one of PM312 and PM316 may be offered as part of third-year mathematics units.

Students are also reminded that the subject Physical Sciences III is available. Students taking this subject may take some or all of their components from any of those listed below for which they have the required prerequisites.

**Prerequisites:** These are shown in the following table. In each case the appropriate prerequisite must be passed at a standard determined by the

chairman of the appropriate mathematics department. Students will be notified with their examination results if they have not reached this standard.

Subject	Prerequisites
Applied Mathematics III	Applied Mathematics II, PM201, PM202 and PM203.
Pure Mathematics III	Pure Mathematics II, including PM202.
Mathematical Statistics III	Mathematical Statistics II, including ST203.
Computer Science III	Normally a second-year mathematics subject, or Physical Sciences II including a significant proportion of mathematics.

In addition, students taking Mathematical Statistics III are strongly recommended to have taken Pure Mathematics II.

In special circumstances a student with only first-year mathematics but with some knowledge of computing may be allowed to enrol in Computer Science III.

**Note:** Each component has its own prerequisite; in special cases prerequisites may be waived by the chairman of the appropriate mathematics department.

Students intending to take final honours in mathematics must have passed the subject Pure Mathematics II and should consult the various prerequisites for final-honours components before choosing their third-year components.

**Preliminary and Prescribed Reading:** A list of books for preliminary and prescribed reading will be handed out to all students at the end of 1973. Further prescribed reading in various components may be given during the lectures in these components.

## COMPONENTS AVAILABLE

The components for 1974 are listed below. Each department reserves the right to cancel any component in which insufficient interest is shown, or may offer further components. The letters in the code indicate whether the component is pure mathematics (PM), applied mathematics (AM), mathematical statistics (ST), or computer science (CS).

The components in pure mathematics are likely to be offered as follows:

- Term 1: PM303, PM305, PM307, PM314, PM317
- Term 2: PM302, PM304, PM306, PM315.
- Term 3: PM308, PM309, PM310, PM311, PM313.



**PM301 Linear Algebra** (two credit points) (Prerequisite: PM203) (This component will not be given in 1974)

Inner-product spaces. Self-adjoint and normal operators, eigenvalues and eigenvectors. Projections and the spectral theorem. Completely continuous operators.

**PM302 Measure Theory** (three credit points) (Prerequisite: PM305)  
General measures on  $\sigma$ -algebras. Measurable functions. Integration, and convergence theorems.

**PM303 Advanced Calculus A** (two credit points) (Prerequisite: PM202)  
A modern approach to differential calculus in higher dimensions: derivative as a linear map, chain rule, higher derivatives and Taylor's theorem, inverse function theorem.

**PM304 Advanced Calculus B** (two credit points) (Prerequisite: PM303)  
Integration of functions of several variables: Jordan content, integral as a linear map, change of variables theorem.

**PM305 Topology** (two credit points) (Prerequisite: PM202)  
Metric spaces, limits, continuity, and completeness. Topological spaces. A discussion of general topological properties.

**PM306 Group Theory** (two credit points) (Prerequisite: PM206)  
Jordan-Holder Theorem. Sylow theorems. Soluble groups and nilpotent groups. Permutation groups. Linear groups.

**PM307 Rings and Modules** (three credit points) (Prerequisite: PM206)  
Principal ideal domains. Elementary theory of modules, leading to finitely generated modules over a principal ideal domain. Application to abelian groups and linear transformations.

**PM308 Fourier Series** (three credit points) (Prerequisite: PM302)  
Convergence of Fourier series. An introduction to some related parts of functional analysis. The Banach-Steinhaus theorem.

**PM309 Field Theory** (two credit points) (Prerequisite: PM206)  
Field extensions, leading to Galois theory.

**PM310 Lattice Theory** (two credit points) (Prerequisite: PM305)  
Posets and lattices. Distributive and modular lattices. Ideal and representation theory. Spaces of prime and minimal prime ideals.

**PM311 Combinatorial Theory** (two credit points) (This component is identical with CS307)

Elementary graph theory. Enumeration techniques with applications to non-numerical computation. Block designs and error correcting codes.

**PM312 Formal Logic B** (six credit points) (Prerequisite: PM208, or Philosophy IIFA/IIIFA) (This component is identical with Philosophy IIFB/IIIFB).

A study of propositional and predicate logic, by considering some formal systems and their semantics, and an introduction to axiomatic set theory.

**PM313 Number Theory** (two credit points)

Congruences. Fermat's Theorem. Quadratic residues. Representation of integers as sums of squares.

**PM314 Function of a Complex Variable** (two credit points) (Prerequisite: PM201) (This component is incompatible with AM301).

Differentiation and integration of functions of a complex variable. Cauchy's integral theorem. Introduction to contour integration.

**PM315 Game Theory** (two credit points) (Prerequisite: PM205)

Two person non-zero sum games, n-person games, infinite games.

**PM316 Philosophy of Mathematics** (six credit points) (Prerequisite: PM208 or Philosophy IIFA/IIIFA) (This component is identical with Philosophy IIPM/IIIPM).

A study of some problems in the foundations of mathematics including a study of the logicist, formalist and intuitionist views, and an examination of some mathematical concepts such as number, set and infinity.

**PM317 Foundations of Mathematics** (two credit points) (Prerequisite: PM208 provides useful background, but is not essential).

A preparatory section on first order logic is followed by one of the following possible systems which form a foundation for mathematics. (Different systems may be lectured year to year): Theory of simple types. Zermelo – Fraenkel set theory. Von Neumann – Bernays – Godel set theory. Categorical algebra.

**AM301 Methods of Applied Mathematics** (six credit points) (Prerequisites: AM201, AM202, AM203, PM201, PM202 and PM203) (This component is incompatible with PM314).

Topics selected from: Complex analysis. Hilbert spaces. Differential equations including Sturm-Liouville theory. Boundary-value problems. Calculus of variations. Distributions and generalized functions.

**AM302 Potential Theory** (five credit points) (Prerequisites: AM201, AM202, AM203, PM201)

Gravitation. Solution of Laplace's equation. Conformal mapping techniques with applications. Irrotational fluid mechanics. Water waves. Electrostatics and magnetostatics.

**AM303 Special Relativity Theory** (two credit points) (Prerequisites: Mathematics IB and AM204)

Lorentz transformation. Minkowski space-time, space-time, particle kinematics and ray optics, mechanics of a particle, Maxwell field.

**AM304 Three-dimensional Dynamics** (two credit points) (Prerequisites: AM202, AM204)

Rotating co-ordinate systems. Rigid body motion. Variational principles. Small vibrations.

**AM305 Introduction to Quantum Mechanics** (four credit points) (Prerequisites: AM204, AM301)

Hamiltonian systems. Vector spaces and linear operators, wave functions and wave equations. Angular momentum. Perturbation theory. Scattering.

**AM306 Electromagnetic Theory** (two credit points) (Prerequisites: AM302, AM303)

Steady fields and currents. Maxwell's equations. Plane waves. Radiation.

**AM307 Elasticity** (two credit points) (Prerequisites: AM201, AM202, AM203, PM201, PM202, PM203, AM302)

Stress and strain quadrics. Compatibility conditions. Navier equation in Isotropic media. Boundary value problems.

**AM308 Numerical Analysis** (two credit points) (Prerequisite: AM205) (This component is identical with CS305)

Calculation of eigenvalues and eigenvectors. Perturbation theory. Error analysis. Iterative solutions of equations. Solution of partial differential equations.

**AM309 Computer Design** (two credit points) (This component is identical with CS302)

Hardware components. Boolean algebra and its application to the design of circuits. Computer logic and arithmetic. Storage. Characteristics and handling of peripheral devices.

**AM310 Ordinary Differential Equations** (two credit points) (Prerequisite: AM202)

Series solutions of differential equations. Comparison theorems. Bessel, Legendre, Hypergeometric functions. Orthogonal polynomials.

**ST301 Techniques of Mathematical Statistics** (four credit points) (Prerequisite: ST201)

Transformations in one and many dimensions, derivation and sampling distributions for  $t$  and  $F$ ; characteristic functions, inversion and uniqueness theorems, continuity theorems, leading to the central limit theorem and the weak law of large numbers; the multivariate normal distribution, order statistics and the elements of non-parametric methods.

**ST302 Inference** (four credit points) (Prerequisite: ST301, ST202)  
Estimation, concepts of sufficiency and maximum likelihood, confidence intervals, hypothesis testing, the Neyman-Pearson lemma, asymptotic methods, Bayes methods.

**ST303 Linear Hypothesis Theory** (four credit points) (Prerequisites: ST203, ST301, ST302)

A general treatment, using the multivariate normal distribution of problems of estimation and hypothesis testing with linear models.

**ST304 Non-parametric Methods** (two credit points) (Prerequisite: ST302)  
Order statistics, sample distribution function, Glivenko-Cantelli theorem, Kolmogorov's statistic and test, Wilcoxon's statistic and test. Sign test, run test. Non-parametric confidence intervals.

**ST305 Sequential Analysis** (two credit points) (Prerequisites: ST301, ST302)

Wald's lemma and identity; the sequential probability ratio test and its properties. Other sequential procedures. Sequential estimation and fixed-width confidence intervals.

**ST306 Sampling Theory** (two credit points) (Odd-numbered years only. This component is identical to ST206)

Methods of analysis of sample surveys; simple random sampling; cluster sampling, stratified sampling.

**ST307 Stochastic Processes** (four credit points) (Prerequisite: ST201, and in 1974, ST207)

Waiting times, 0-1 laws, recurrent events, Markov chains, simple time-dependent stochastic processes.

**ST308 Operations Research** (three credit points) (Prerequisite: ST202)  
Optimization problems, including linear programming and allocation and sequencing problems, applications of the theory of games; introduction to queuing theory; critical path analysis, inventory and replacement.

The components in Computer Science are likely to be offered as follows:

Term 1: CS301, 302, 305

Term 2: CS301, 303, 306

Term 3: CS301, 304, 307

**CS301 Practical Programming** (four credit points)

This will involve one 2-hour practical session per week for the whole year. which students will spend either studying languages, coding problems, or running programmes. Students will be expected to become proficient in ALGOL and MACRO, and to be acquainted with FORTRAN, COBOL and a non-numeric language.

**CS302 Computer Design** (two credit points) (This component is identical with AM309)

Hardware components. Boolean algebra and its application to the design of circuits. Computer logic and arithmetic. Storage. Characteristics and handling of peripheral devices.

**CS303 Programming Languages** (two credit points)

Translation programmes. Syntax. Grammars. Compiling techniques, exemplified by ALGOL 60.

**CS304 Computer Systems and Applications** (two credit points)

Supervisors and operating systems. Data management and file handling. Practical applications. Real-time systems.

**CS305 Numerical Analysis** (two credit points) (Prerequisite: AM205) (This component is identical with AM308)

Calculation of eigenvalues and eigenvectors. Perturbation theory. Error analysis. Iterative solution of equations. Solution of partial differential equations.

**CS306 Information Theory** (two credit points) (Prerequisite: ST201)

The concepts of information and entropy. Entropy of certain information sources. Channel capacity, noise, and coding.

**CS307 Combinatorial Theory** (two credit points) (This component is identical with PM311)

Elementary graph theory. Enumeration techniques with applications to non-numerical computation. Block designs; error-correcting codes.

**Class Requirements:** Class requirements will be given to the student at the beginning of and during the year. Tutorials of practice classes, as arranged for each component. Regular written exercises in each component.

**Examination Requirements:** About three 3-hour written papers in each subject; the number may vary according to the components chosen. Shorter papers may be set and tests held throughout the year.

## HONOURS COURSES

### Pure Mathematics IV, Applied Mathematics IV and Mathematical Statistics IV

A student wishing to enrol in one of the subjects Pure Mathematics IV, Applied Mathematics IV or Mathematical Statistics IV should apply to the chairman of the appropriate department as soon as the results of his third-year examinations are known. As in earlier years, a component system is available to offer choice. A student's choice is not restricted to the components in the subject in which he is enrolled; subject to the detailed

requirements below he may select one or more components from the other two subjects. Each student must take components totalling at least 30 points.

In addition to his work in these components, each student will be required to write a thesis which will be taken into account in his final assessment. The thesis will be supervised by a staff member in the appropriate mathematics department.

**Pure Mathematics IV.** The prerequisite is Pure Mathematics III, normally with a grade B or better. Each student must take fourth-year components totalling at least 30 points, at least 18 of which must be from Pure Mathematics. The thesis counts as approximately one-third of the year's work.

**Applied Mathematics IV.** The subject prerequisite is a pass in Applied Mathematics III with a grade B or better. Each student must take fourth-year components totalling at least 30 points, at least 18 of which must be from applied mathematics. The thesis counts as approximately one quarter of the year's work.

**Mathematical Statistics IV.** The prerequisite is Mathematical Statistics III, with a grade B or better. Students are also strongly advised to have taken Pure Mathematics III, especially the component PM302. Each student must take fourth-year components totalling at least 30 points, at least 18 of which must be from mathematical statistics. The thesis counts as approximately one-third of the year's work. The credit point values of mathematical statistics components vary and students are asked to consult the chairman of the department of statistics in selecting their components.

The components offered in fourth-year are listed below: each department reserves the right to withdraw any component in which insufficient interest is shown, or to offer further components.

In special cases prerequisites may be waived by the chairman of the appropriate department.

**PM401 Group Theory** (six credit points) (Prerequisite: PM306)

Transfer and fusion. Groups of prime power order. Character theory: orthogonality relations, induced characters, T. I. sets, application to Frobenius groups.

**PM402 Differentiable Manifolds** (six credit points) (Prerequisites: PM303, PM305)

Selected topics from differential topology and differential geometry.

**PM403 Noncommutative Rings** (six credit points) (Prerequisite: PM307)

Selected topics from the theory of Noncommutative Rings.

**PM404 Advanced Topics in Nonlinear Programming** (six credit points) (Prerequisite: PM205)

Quadratic and convex programming. Duality. Integer and fractional programming. Programming in complex space.

**PM405 Functional Analysis** (six credit points) (Prerequisite: PM308)  
Integral representation theory. Locally convex topological vector spaces and the Hahn-Banach Theorem. Duality Theory. The Stone-Weierstrass-Theorem. Banach algebras.

**PM406 Topics in Algebraic Topology** (six credit points) (Prerequisites: PM206, PM305)

Homotopy theory. Homotopy of paths. The fundamental group functor. Homotopy of maps. Covering spaces and lifting theorems. Higher homotopy groups and related functors.

**PM407 Complex Analysis** (six credit points)

The exponential function and analytic continuation. The winding number, germs, and composition of germs. Fractional linear transformations and non-euclidean geometry. Uniformization theorems..

**PM408 Lie Algebras** (six credit points) (Prerequisites: PM306, PM307)  
Soluble and nilpotent Lie algebras. The structure and classification of complex semi-simple Lie algebras.

**PM409 Mathematical Logic** (six credit points) (Prerequisite: PM312 or Philosophy IIFB/IIIFB) (This component is identical with the mathematical logic component in Philosophy IV.)

Metatheory for classical first-order and second-order quantificational logic. Philosophy of mathematics.

**AM401 Mathematical Methods** (eight credit points) (Prerequisite: AM301)

Topics selected from: generalized functions. Asymptotic methods. Integral transforms. Integral equations. Applications of functional analysis. Special functions. Lie groups. Complex variables. Lebesgue integral.

**AM402 Continuum Mechanics** (eight credit points) (Prerequisites: AM301, AM302)

Topics selected from: Motion of Newtonian fluid. Boundary layer theory. Lubrication theory. Hydrodynamic stability. Compressible flow. Elasticity.

**AM403 General Relativity** (eight credit points) (Prerequisites: AM301, AM303)

Tensor analysis, Riemannian geometry, Einstein's theory of gravitation, Schwarzschild's solution, gravitational red-shift, perihelion advance, bending of light ray, cosmological models.

**AM404 Analytical Mechanics** (eight credit points) (Prerequisites: AM301, AM304)

Hamiltonian systems, global dynamics, transformation theory, stability and perturbation theory.

**AM405 Quantum Mechanics** (eight credit points) (Prerequisites: AM301, AM303, AM305)

Advanced quantum field theory and quantum electrodynamics.

**AM406 Electromagnetism** (eight credit points) (Prerequisites: AM301, AM302, AM303 AM306)

Maxwell's equations; polarization; wave guides; radiation from point charge.

**AM407 Astrophysics** (eight credit points) (Prerequisites: AM301, AM302)

Simple stellar models. Small oscillations. Stability.

**AM408 Numerical Analysis** (eight credit points) (Prerequisites: AM301, AM308)

Projection methods. Iterative methods. Order of convergence. Error analysis. Application of elementary functional analysis to numerical analysis.

**AM409 Statistical Mechanics** (eight credit points) (Prerequisite: AM301, AM305)

Maxwell-Boltzmann statistics, ideal gas, quantum statistics, thermodynamics, specific heats.

**ST401 Probability Theory** (Prerequisite: PM302)

Probability theory as a part of measure theory. Standard theorems and techniques.

**ST402 Probability Theory II** (Prerequisite: ST401)

**ST403 Inference**

Advanced estimation theory and hypothesis testing.

**ST404 Multivariate Analysis** (Prerequisite: ST303)

Estimation and hypothesis testing with the multivariate normal distribution. Generalized analysis of variance.

**ST405 Time Series**

Introduction to spectral theory; estimation and hypothesis testing in time series.

**ST406 Operations Research** (Prerequisite: ST308)

Advanced topics in inventory, optimization procedures, game theory, network and flow theory.



### **ST407 Stochastic Processes (Prerequisite: ST307)**

Markov processes, diffusion processes, branching processes, renewal theory.

### **ST408 Game and Decision Theory**

An introduction to decision theory and its relation to game theory.

### **ST409 Distribution Theory (Prerequisite: ST401)**

The algebra of distribution functions. Infinitely divisible, stable and associated laws.

### **ST410 Sequential Analysis (Prerequisite: ST305)**

Theoretical approach to sequential analysis using stopping rules.

### **ST411 Non-parametric Analysis (Prerequisite: ST304)**

Inference with unknown distributions; distribution free tests, theory of rank tests.

### **ST412 Foundations of Statistical Inference**

Study of various schools of thought in statistical inference and their logical foundations.

Preliminary reading, prescribed reading and class and examination requirements in Mathematics IV will be given to the student at the beginning of and during the year.

## **POSTGRADUATE STUDIES**

Qualified candidates will be accepted for the degree of MA, M Sc and Ph D in a number of branches of mathematics. More detailed information can be obtained from the chairman of the appropriate mathematics department. Research interests of members of the departments comprise abstract algebra, including group theory and ring theory, lattice-ordered groups, combinatorial theory, mathematical programming, functional analysis, topology, approximation theory, differential equations, numerical methods, computing, astrophysics, fluid mechanics, hydrodynamic stability, statistical mechanics, quantum mechanics, symmetry algebras, general relativity, electrochemistry, electromagnetism, probability theory, statistical analysis of stochastic processes, mathematical ecology, regression, mathematical epidemiology, biological cell kinetics, queueing and storage theory, and Markov processes.

## **PHILOSOPHY**

For details see Part I of the handbook containing disciplines offered by the School of Humanities.

## PHYSICAL SCIENCES

### PHYSICAL SCIENCES IT

This is a one-year terminal course in physical sciences and consists of components from mathematics and physics.

As distinct from Physical Sciences II and III, Physical Sciences IT is not available to students enrolled in the School of Physical Sciences. It is a combination of mathematics and physics.

**Prerequisites:** Although a knowledge of physics and chemistry to higher school certificate level is desirable, a student who has obtained a good pass at leaving level would be accepted. In such cases the preliminary reading suggested should be carefully studied.

#### Preliminary Reading

Courant, R. and Robbins, H. *What is Mathematics?* Oxford Univ. Pr.

Selected topics from one or other of the following books:

Messell, H. ed. *Modern Introduction to Physics* Vols I and II Horwitz and Graham;

Physical Sciences Study Committee *Physics* Heath and Co.

#### Mathematics Component

Differentiation and integration of simple algebraic and trigonometric functions. Taylor series (expansion of algebraic, trigonometric and exponential functions). Partial differentiation. Definition and elementary properties of complex numbers. Graphical representation and the complex exponential functions. Addition and multiplication of vectors. The gradient of scalar functions and also the Laplace equation. Simple differential equations.

**Physics Component** (36 lectures plus one term laboratory)

#### PH110 Environmental Physics (21 lectures)

The states of matter, solids, liquid gases. Stress and strain, elasticity. Hydrostatics, fluid dynamics, viscosity Stokes law, and terminal velocity. Electromagnetic spectrum, Kirchoff's Stefan-Boltzmann and Wien's laws. Planck's distribution and quantum theory of radiation. The solar spectrum and solar constant. Radiation observed at the ground. Temperature, pressure, gas laws, heat and work laws of thermodynamics. Thermodynamics. Thermal stresses. Heat conduction and convection. Physical environment of the biosphere. Energy balance at a surface e.g. earth, animal or plant. Modern physics. Radioactivity, X-rays, elementary particles, nuclear physics.

### **PHIII Electrical Circuit Theory (15 lectures)**

D.C. Circuits: Resistances in series and parallel; Kirchoff and Thevenin theorems. A.C. Circuits: Sinusoidal voltage and current. Resistive load, instantaneous power, average power, differential properties of R, L and C, Phaser concept. L, LC, LRC circuits, and associated properties. P-N junctions.

**Class Requirements:** Approximately three lectures a week for three terms. Tutorial classes each week in physics and mathematics and one term of physics laboratory work in electronics.

**Examination Requirements:** Two 3-hour written papers, or equivalent.

### **PHYSICAL SCIENCES II AND III**

Physical Sciences II and III are subjects which can be made up of components of any physical science subject, with the provision that the same component cannot be counted as part of two subjects. The work value of the segments must total at least 12 units in the second year and 18 units in third year. The units chosen must be recorded by the adviser of studies in physics as well as all subsequent changes.

### **PHYSICAL SCIENCES II**

Segments from second-year subjects which may be included in Physical Sciences II can be chosen from the following, and the total work value must be at least 12 credit points.

#### **Chemistry**

Inorganic Chemistry IIB, Organic Chemistry II and Physical Chemistry IIA. Each may be taken singly or in combination provided that chemistry is not taken as a major subject at the second-year level. The prerequisite for each is Chemistry I and each has a work value of four credit points.

#### **Geology**

Crystal optics may be taken by itself *or* crystal optics together with igneous petrology or metamorphic petrology or sedimentology may be taken for six credit points.

#### **Mathematics**

A student may take any second-year mathematics component for which he has the prerequisite. Advice on the choice of components may be obtained from advisers in the mathematics departments.

#### **Physics**

Second-year physics components may be chosen in one of the following ways:

1. Four credit points from PH201 to PH207, together with two laboratory courses.
2. Six credit points from PH201 to PH207, together with three laboratory courses.
3. Eight credit points from PH201 to PH207, together with four laboratory courses.

Students must discuss their choice of components in physics with one of the advisers of studies in physics.

**Philosophy**

Students may choose from Philosophy IIFA, IISA, IIPM, IIFB. Each counts as six credit points. With the permission of an adviser of studies in the School of Physical Sciences other second year philosophy subjects may be chosen.

**PHYSICAL SCIENCES III**

Segments from third-year subjects which may be included in Physical Sciences III can be chosen from the following; and the total work value must be at least 18 credit points.

**Chemistry**

Inorganic Chemistry IIIB, Organic Chemistry III, and Physical Chemistry III. Each may be chosen singly or in combination provided that chemistry is not being taken as a major subject at the third-year level. The prerequisite for each is the appropriate course from Chemistry IIA, or, in special cases IIB and each as a work value of six credit points.

Students should note that the completion of sections of the chemistry courses in Physical Sciences III does not qualify them for admission to the honours school of chemistry. However, in every case, intending honours students should make application to the head of the appropriate division of chemistry.

**Mathematics**

A student may take any component from Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III or Computer Science III for which he has the prerequisite. Advice on the choice of components may be obtained from advisers in the mathematics departments.

**Physics**

Third-year physics components may be chosen in one of the following ways:

1. Two credit points from PH301 to PH308 and one laboratory credit point (three points).

## PHYSICS

2. Four credit points from PH301 to PH308 and two laboratory credit points (six points)
3. Six credit points from PH301 to PH308 and three laboratory credit points (nine points).
4. Eight credit points from PH301 to PH308 and four laboratory credit points (twelve points).

Alternatively, students enrolled in Physics IIIA may choose components from Physics IIIB together with mathematics or chemistry components to meet the requirements for Physical Sciences III.

Students must discuss their choice of components in physics with the physics adviser of studies.

### Philosophy

Students may choose from Philosophy IIIFA, IIISA, IIIPM, IIIFB, IIILA, IIISB. Each counts as six credit points. With the permission of an adviser of studies in the School of Physical Sciences other third-year philosophy subjects may be chosen.

## PHYSICS

A student majoring in physics for the B Sc degree takes the sequence Physics I, Physics II, Physics IIIA. A mathematics subject is required in first and second year to proceed to the next year and Applied Mathematics III is recommended as the second subject in third year for those students intending to go on to Physics IV for an Honours B Sc degree.

Physics IIIB is intended to give a broader view of physics and can only be taken with Physics IIIA.

### PHYSICS I

Physics I courses will be conducted on the assumption that students have reached a standard in physics and in mathematics equivalent to that of higher school certificate level.

#### SYLLABUS

##### PH101 Electrical Circuit Theory

D.C. circuits: resistances in series and parallel; circuit theorems (Kirchoff, Thevenin, Norton, maximum power transfer) and circuit analysis; measuring instruments and circuits. A.C. Circuits; sinusoidal voltage and current. Resistive load, instantaneous power, average power, properties of R, L and C; transformer, vector representation and complex notation; measuring

bridge and the C.R.O. LCR circuits and associated properties (frequency response, filters, resonance, transients).

#### **PH102 Mathematical Introduction**

Differential and integral calculus (physicist's viewpoint). Vector algebra. Complex numbers. Errors. Distributions, physical quantities and dimensions. Linear differential equations. Kinematics.

#### **PH103 Wave and Field Propagation**

General wave phenomena and their inter-relationships. Superposition of waves (interference, diffraction) and its applications to mechanical, sound and electromagnetic waves. Geometrical optics.

#### **PH104 Electricity and Magnetism**

Coulomb's law; Lorentz force relation; electron motion in uniform electric and magnetic fields; Law of Biot and Savart; Ampere's Law; Gauss's Law; calculation of simple electric and magnetic field configurations; dielectrics; capacitance; induction effects.

#### **PH105 Mechanics and Special Relativity**

Accelerated frames. Energy. Gravitation. Simple harmonic motion. Rotational kinematics and dynamics. Special relativity theory. Lorentz Fitzgerald contraction. Time dilation. Variation of mass with velocity. Energy. Photons.

#### **PH106 Modern Physics**

Brief historical introduction. De Broglie relationships. Wave particle dualism. Electrons as waves. Electron diffraction. Wave packets. Phase and group velocities. Heisenberg's uncertainty principle, the wave equation. Characteristics of X-rays (production, theory).

#### **PH107 Nuclear Physics**

Objectives, hierarchy of forces, nomenclature and units, nuclear radius, nuclear mass and binding energy, stability considerations and decay processes, energy level diagrams.

#### **PH151, PH152, PH153**

A three-term introductory course in electronic measurement techniques.

**Class Requirements:** Lectures – three a week for three terms. Tutorials – one a week for three terms. Laboratory – four hours a week for three terms.

**Examination Requirements:** Each unit course, as outlined above, will be examined either at the end of term or at the end of the year as appropriate. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final results.

# PHYSICS

## **Preliminary Reading**

Physical Science Study Committee *Physics* 2nd rev. edn, Heath 1965  
OR

Stollberg, R. and Hill, F.F. *Physics: Fundamentals and Frontiers* Arnold  
1966

**Prescribed Reading:** Many texts for first-year physics are available and most would cover the course satisfactorily. Those which will be used by the lecturers are given below and the student should choose whichever is more attractive.

## **EITHER**

Alonso M. and Finn, E.J. *Physics* Addison-Wesley 1970

## **OR**

Beuche, F. *Introduction to Physics for Scientists and Engineers* McGraw-Hill

## **PHYSICS II**

**Prerequisites:** Students enrolling in any portion of this subject will normally be expected to have completed the Physics I course and Mathematics IA or Mathematics IB.

## **SYLLABUS (12 credit points constitute Physics II)**

### **PH201 Physical Electronics (one credit point)**

Conduction in solids; intrinsic and extrinsic semi-conductors; pn junction; diode circuit applications; junction transistor; transistor configurations; transistor biasing, hybrid model; analysis of amplifier circuits; vacuum diode, triode, pentode.

### **PH202 Physical Optics (one credit point)**

Description, production and analysis of polarized light; Jones matrices. Geometrical optics; thick lenses.

### **PH203 Classical Mechanics and Relativity (two credit points)**

Generalized co-ordinates, velocities and momenta, Lagrangian function and Lagrange's equation. Conservation laws. Central field; collision problems; systems of particles. Conservation systems. Hamiltonian function and Hamilton's equation. Poisson bracket. Rigid-body dynamics; Inertia tensor, Minkowski's space-time; geometric representation of space time. Four-vector formulation of special relativity; four-velocity, four momenta, four-force. Transformation of dynamic quantities. Relativity and electromagnetism.

**PH204 Thermodynamics (two credit points)**

Classical thermodynamics with applications to low temperature physics.

**PH205 Quantum Mechanics (two credit points)**

Magnitudes of physical quantities in quantum mechanics. Uncertainty principle. Fourier transforms. Schroedinger equation. Barrier-well problems. Harmonic oscillator. Average values in Q.M. Legendre, Laguerre introductory matrix mechanics.

**PH206 Solid State Physics (one credit point)**

Crystal structure, crystal diffraction, elastic constants and elastic waves, phonons and lattice vibrations.

**PH207 Electromagnetic Theory (two credit points)**

Mathematical preparation, Maxwell's equations in differential form, method of solution in Laplace's equation, the wave equation and electrodynamic potentials.

**PH208 Fluid Dynamics (one credit point)**

Equation of continuity. Particle rates of change and local rates of change. Streamlines. Euler's equation of motion. Bernoulli's equation, three-dimensional potential flow. Circulation. Some potential theorems. Stream function and two-dimensional flow. Viscous flow; the Navier-Stokes equation for viscous incompressible flow. Poiseuille's law. Stokes' formula

**PH251, PH252, PH253, PH254, PH255, PH256:** Associated laboratory courses, credit for these is included in the above theory courses.

**Class Requirements:** Lectures – four a week for three terms. Laboratory – four hours a week for three terms.

**Examination Requirements:** Each unit course as outlined above will be examined either at the end of term and at the end of the year. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final result.

**Preliminary Reading:** See prescribed reading for Physics I.

**Prescribed Reading**

Reitz and Milford *Foundations of Electromagnetic Theory* Addison-Wesley 1960

Leighton, R.B. *Principles of Modern Physics* McGraw-Hill, Paperback 1959

Kittel, C. *Introduction to Solid State Physics* 4th edn, Wiley, or Elliott, R.J., and Gibson, A.F. *Introduction to Solid State Physics*, 1st edn Macmillan

Pippard, A.B. *Classical Thermodynamics* Cambridge 1966

Millman and Halkias *Integrated Electronics* McGraw-Hill 1972



Landau and Lifshitz *Mechanics* Addison-Wesley 1960

## PHYSICS IIIA

Students intending to continue to honours physics are advised to enrol in a third year mathematics unit as their other third year subject. The following mathematics units are considered to be useful for a continuing study of physics: PM301, 308, 314; AM301, 302, 304, 305.

No quantum mechanics is taught in Physics IIIA and it is recommended that students take AM305 to provide the necessary background for Physics IV.

Students interested in a more mathematical approach at third year should consider enrolling in Physical Sciences III. In special circumstances students may be allowed to take only theoretical components of Physics IIIA.

**Prerequisites:** A student enrolling in this subject will be expected to have completed the Physics II course and one of the second-year courses in mathematics.

### **SYLLABUS (18 credit points constitute Physics IIIA)**

#### **PH302 Electronics (one credit point)**

FET's and MOSFET's; feedback amplifiers, properties of negative feedback and stability; sinusoidal oscillators; relaxation oscillators; constant-K and m-derived circuits.

#### **PH303 Electromagnetic Theory (two credit points)**

Maxwell's equations and e.m. waves in vacuo matter. Retarded and Hertz polarization potentials. Poynting's theorem. Application of Maxwell's equations; transmission lines, wave guides, cavities and aerials, accelerated charges, scattering and dispersion. Electromagnetism, special relativity and quantum theory.

#### **PH304 Nuclear Physics (two credit points)**

Introduction (forces, terminology and units, angular momentum, cross-section Rutherford scattering). Mass and binding energy. Semi-empirical mass formula and nuclear stability. Nuclear decay and parity. I-spin. Independent particle model. Single-particle shell model. Configuration mixing and intermediate coupling. Collective model. Single-particle states in a deformed potential.

#### **PH305 Statistical Mechanics (two credit points)**

Quantum statistical mechanics. Statistical description of ensembles of a large number of particles and its application to metals, gases and  $\text{He}^4$ .

**PH306 Optics (one credit point)**

Reflection from dielectric and metallic surfaces, and thin films. Introduction to laser physics.

**PH307 Solid State Physics (two credit points)**

Free electron Fermi gases. energy bands in solids. Semiconductor materials and transport properties of semiconductors.

**Ph308 Atomic Physics and Spectroscopy (two credit points)**

Vector model of the atom, spectral states. Perturbation theory. Selection rules. Atoms in magnetic fields. Complex spectra. Introduction to molecular spectra.

**Laboratory Courses**

PH351, PH352, PH353, PH354, PH355 and PH356 – each one credit point.

**Class Requirements:** Lectures – four a week for three terms. Laboratory – eight hours a week for three terms.

**Examination Requirements:** Four 3-hour papers. The laboratory work of each student is assessed continually throughout the year and is taken into account in determining the overall performance of the student.

**Preliminary Reading:** See prescribed reading for second year.

**PHYSICS IIIB**

The course is a terminal course and only taken with Physics IIIA. The course is designed to provide a broader and less theoretical view of the recent achievements and techniques of physics.

In special circumstances students who complete Physics IIIB may be permitted to enrol in Physics IV.

**SYLLABUS: (18 credit points constitute Physics IIIB.)**

**PH310 Experimental Methods (four credit points)**

Specialised electronic techniques, digital circuits, elementary computer logic vacuum systems, vacuum technology.

**PH311 Physics of the Earth (four credit points)**

Seismology or wave propagation in the earth, solar and terrestrial relationships, geophysics.

**PH312 Physics of Materials (four credit points)**

Low temperature phenomena, liquid helium, first and second sound, superconductivity, magnetic resonance, electron emission from solids, work functions, photoelectron spectroscopy.

**Class Requirements:** Lectures and reading courses as arranged. Four hours a week for three terms. Laboratory – eight hours a week for three terms.

**Laboratory:** Laboratory work consists of projects supervised by a member of staff. Six credit points of laboratory are available.

**Examination Requirements:** Performance in the course will be assessed either by examination or during the year as determined.

## PHYSICS IV

**Prerequisites:** A student enrolling in this subject will be expected to have completed the Physics IIIA course. Admission to this course is at the discretion of the chairman of the department. The course consists of 20 credit points selected from the following.

### SYLLABUS

#### **PH401 Mathematical Physics and Statistical Mechanics (three credit points)**

Use of Green's functions in the Many-Body problem. Feynman Diagrams. Quasi-particles. Dyson's equation approximations. Applications to superconductivity, electron gas in metals, superfluids. Liquid state.

#### **PH402 Elementary Particles Physics (one credit point)**

Interactions. The particles (graviton, photon, neutrinos, muons, pions, other mesons, hyperons, baryon resonances, meson resonances, anti-particles). Classifications.

#### **PH403 Nuclear Physics (one credit point)**

Nuclear reactions. The compound nucleus. Resonant reactions. Optical model. Direct reactions, isobaric analog states.

#### **PH404 Quantum Mechanics (three credit points)**

Relativistic quantum mechanics, Klein-Gordon equation. Dirac equation, field quantisations, Feynman diagrams.

#### **PH405 Solid State Physics (two credit points)**

Diamagnetism. Paramagnetism. Ferro, ferri, and antiferromagnetism. Magnetic resonance.

#### **PH406 Relativity (two credit points)**

Tensors. Einstein's gravitational equations. Schwarzschild space-time. Three tests of gravitation theory.

#### **PH407 Special Relativity (one credit point)**

A detailed look at the application of the special theory to one branch of physics.

#### **PH408 Scattering Theory (one credit point)**

Classical theory of scattering, and the conditions of validity. Differential

and total collision cross-sections. Quantum theory of scattering; particle wave analysis; phase-shift calculations; scattering by central field; the Born approximation.

**PH409 Plasma Physics (one credit point)**

Motion of charged particles in force fields. Macroscopic motion of plasma in force fields. Waves in a plasma.

**PH410 Ionization Physics (one credit point)**

The properties of weakly ionized gases. Interaction of charged particles with surfaces. Electrical breakdown of gases.

**Options:** Certain units in advanced mathematics courses may be taken in place of some of the units listed above. Any such interchange must be approved by the chairman of the department.

**Project:** Students are required to choose either an experimental or theoretical project-area, which shall carry 25 per cent of the total assessment for the year (5 credit points).

Students who choose the theoretical option shall be required to take three additional lecture courses (theory of kinetic equations, group theory in physics and magnetohydrodynamics), and to undertake a small theoretical project. This is the equivalent of 5 credit points.

**Class Requirements:** Lectures – eight a week till completed. Project – 16 hours a week for two terms.

**Examination Requirements:** Up to eight 3-hour papers. However, it is anticipated that a number of lecture courses and project areas will be assessed or examined during the course of the year.

## POSTGRADUATE STUDIES

Postgraduate studies and research are conducted in the divisions of physics of which there are at present two. Entry qualifications are a good honours degree in physics, theoretical physics, applied mathematics, physical chemistry, molecular science or any other related subject. Students may proceed to the degree of M Sc or Ph D.

### **Division of Electron Physics (Professor D.E. Davies)**

Ionization phenomena in pure gases with particular reference to a study of the plasma/surface interface. Solid state collision phenomena studies by means of electron, photon and ion induced electron emission. Photoelectron spectroscopy. Electron spin resonance, nuclear spin resonance and laser interferometry of solid surfaces.

# PSYCHOLOGY

## **Division of Theoretical and Space Physics (Professor K.D. Cole)**

**Theoretical:** Theory of the earth's ionosphere and magnetosphere. General relativity. Statistical mechanics, theory of liquids. Molecular quantum mechanics.

**Experimental:** Studies relating to the properties of the ionosphere and magnetosphere using radio and optical techniques. Auroral physics. Solar-terrestrial relations.

The division of theoretical and space physics operates a field station in Kilmore Shire and encourages collaborative projects with outside agencies.

## **PSYCHOLOGY**

### **PSYCHOLOGY I (one unit)**

**Dr R.B. Montgomery**

The course is concerned with the study of motivation, with particular emphasis on love and aggression. The study of these two themes will be used to introduce the student to the areas of biological bases of behaviour, development, drive and emotion, learning and memory, sensory-motor integration, and abnormal and social behaviour. There will also be a component of the course concerned with experimental procedure, the techniques for collection and analysis of data, and questions of interpretation of data.

**Class Requirements:** Two one-hour lectures and one three-hour laboratory class a week.

**Examination:** Assessment will be by written laboratory reports, essays, and by objective tests at the end of each term.

#### **Preliminary Reading**

Karllins, M. and Andrews, L.M. *Psychology : What's in it for us?* Random House 1971

Morris, D. *The Naked Ape* Baylis 1967, or Morris, D. *The Human Zoo* Corgi 1971

#### **Prescribed Reading**

Harlow, H.F., McGaugh, J.L., and Thompson, R.F. *Psychology* Albion 1971

Mussen, P. et. al. *Psychology : An Introduction* Heath 1972

Rodger, R.S. *Statistical Reasoning in Psychology* Univ. Tutorial Pr. 1967

Schmaltz, L.W. *Scientific Psychology and Social Concern* Harper and Row  
1971

## PSYCHOLOGY IIB (one unit)

Dr Marie E. Gibbs

**Syllabus:** The course will cover behaviour from essentially four points of view. These are: the development of behaviour, the psycho-biological basis of behaviour, the social aspects of behaviour and the quantification and measurement of behaviour and associated individual differences.

Students will be able to select an emphasis on either the psycho-biological aspects of behaviour or the social aspects of behaviour. Since this is an option of emphasis, some treatment of both aspects will be presented in the general course. Content areas covered will be: motivation; learning and memory; and perception. The course will build on and expand upon the issues raised in the Psychology I course. Like this course, Psychology IIB will be laboratory based and to this extent it will deal with the design of experiments and analysis of data.

**Prerequisite:** Psychology I

**Class Requirements:** Four one-hour lectures a week, and four hours of laboratory session a week for three terms.

**Prescribed Reading:** To be announced before the beginning of the academic year.

### Recommended Reading

Butcher, H.J. *Human Intelligence: Its Nature and Assessment* London: Methuen, London, 1968 (Reprinted 1970, paperback)

Bruner, J.S., Goodnow, J.J. and Austin, G.A. *A Study of Thinking* Wiley, New York 1956

Edwards, A.L. *Experimental Design in Psychological Research* 4th edn Holt, Rinehart and Winston, New York 1972

Gross, C.G. and Zeigler, H.P. *Readings in Physiological Psychology Motivation* Harper and Row, 1969

Gross, C.G. and Zeigler, H.P. *Readings in Physiological Psychology Learning and Memory* Harper and Row 1969

Grossman, S.P. *Essentials of Physiological Psychology* Wiley 1973

Guildford, J.P. *Psychometric Methods* McGraw-Hill, New York 1954

Hays, W.L. *Statistics for Psychologists* Holt, Rinehart and Winston, New York 1963 (Available in paperback)

Hokarson, J.E. *The Physiological Bases of Motivation* Wiley 1969

Keats, J.A. *An Introduction to Quantitative Psychology* Wiley 1972

Lavartelli, C.S. and Stendler, F. *Readings in Child Behaviour and Development* Harcourt Brace, Jovanovich 1972

- Mussen, P.H. ed. *Carmichael's Manual of Child Psychology* 3rd edn, Wiley 1970, 2 vols
- Nash, J. *Developmental Psychology* Prentice-Hall 1970
- Neisser, U. *Cognitive Psychology* Appleton-Century-Crofts New York 1966
- Norman, D.A. *Memory and Attention* Wiley, New York 1969
- Perception: Mechanisms and Models* Readings from 'Scientific American' Freeman 1972
- Rodger, R.S. *Statistical Reasoning in Psychology: An Introduction and Guide* Univ. Tutorial Pr. 1967
- Smith, C.U.M. *The Brain, Towards an Understanding* Faber 1970

## PSYCHOLOGY IIIB (one unit)

**Syllabus:** Three major content areas in psychology will be covered. These are cognition, social behaviour and clinical psychology. They will build on the fundamental aspects of psychology covered in Psychology IIB. As with Psychology I and Psychology II, the course is laboratory based and considerable practical work in each of the fields will be required.

Each course will take approximately one term. In addition, there will be a course of lectures throughout the year which will examine various philosophical and measurement issues in psychology.

**Prerequisite:** Psychology II.

**Class Requirements:** (a) Major content areas : three one-hour lectures per week, three hours laboratory work per week, plus three hours experiments per week. (b) Philosophy and Measurement : a one-hour lecture per week, a one-hour seminar per week.

## Recommended Reading

- Bickman, L. and Hencky, T. *Beyond the Laboratory : Field Research in Social Psychology* McGraw-Hill
- Brown, P. *A First Language: The Early Stages* Harvard Univ. Pr. 1973
- Brown, R. *Social Psychology* Collier-Macmillan Student Edn 1965
- Danziger, K. *Socialization* Penguin 1971
- Danziger, K. *Readings in Child Socialization* Pergamon Press 1970
- Deutsch, A.J. *The Physiological Basis of Memory* N.Y. Academic Press 1973
- Eibl-Eibesfeldt *Ethology - The Biology of Behaviour* Holt Rinehart and Winston Inc. 1970
- Grossman, S.P. *Essentials of Physiological Psychology* N.Y. Wiley 1973

- Insko, C.A. and Schopler, J. *Experimental Social Psychology* Academic Press 1972
- Kintsch, W. *Learning, Memory, and Conceptual Processes* N.Y. Wiley 1970
- Maher, Brendan A. *Principles of Psychopathology* McGraw-Hill 1970 International Student edn
- Maher, Brendan A. *Contemporary Abnormal Psychology* Middlesex, Penguin 1973
- McClintock, C.G. *Experimental Social Psychology* Holt Rinehart and Winston Inc. 1972
- Gross, C.G. and Zeigler, H.P. *Readings in Physiological Psychology : Learning and Memory* Harper and Row 1969

## PSYCHOLOGY IV (Honours)

The course is available for selected candidates who have already qualified for a pass bachelors degree with a major sequence in psychology.

The course consists of the following:

1. A piece of empirical research carried out independently by the candidate which must be presented at a seminar and must be written up as a thesis including a survey of the literature in his area of research.
2. Two essays, at least one of which should be on a theoretical topic, and the other topic will be decided in consultation with the supervisor.
3. Participation in colloquia which will normally be held each week, and will include staff and visiting speakers.

Assessment is based on the essays, seminar paper and thesis.

# ZOOLOGY

## SECOND AND THIRD-YEAR COURSES

### ZOOLOGY II

A course of 50 lectures, and associated practicals and excursions, in which animals will be studied at the population level, with emphasis on the environmental and evolutionary aspects of population biology. Subjects of study will include the growth, evolution, regulation, interactions, ecology and distribution of animal populations, together with population dispersion and social ethology.



## ZOOLOGY

A course of 25 lectures and associated practicals on the evolution and diversity of arthropods and vertebrates.

**Prerequisites:** Biology IB and preferably either Mathematics IA or Mathematics IC.

**Class Requirements:** Three lectures and two 3-hour practical/tutorial classes a week for three terms.

**Prescribed Reading:** Students should consult the zoology student adviser at the time of enrolment for the course, and obtain the reading list when it is published.

## ZOOLOGY III

A course of 25 lectures and associated practicals on the comparative morphology and evolution of nervous, reproductive, excretory, digestive, respiratory, circulatory and skeletal systems of arthropods and vertebrates.

A course of 50 lectures and associated practicals in animal physiology and behaviour. Subjects of study will include cellular structure, proteins and enzymes, membrane biology, cellular bioenergetics and respiration, digestion, respiration, circulation, intermediary metabolism, excretion and osmotic regulation, neurophysiology and sensory physiology, neural integration, the structure and physiology of muscle, principles of endocrinology, reproduction, and ecological physiology. Classical ethology: causation, development and evolution of behaviour. The course includes comparative physiology and insect physiology, but some general principles will be treated with particular reference to vertebrates.

At the end of the first term of the third year, students must select one of the following courses, which will be held in third term. These courses are:

**EITHER**

**Animal Ecology**, in which subjects such as the following will be studied: production ecology, applied ecology (conservation), behavioural ecology, animal dispersal and migration, island biology, biometrics and computer programming, Southeast Australian animal ecology, pest management.

**OR**

**Experimental Physiology**, in which subjects such as mammalian reproduction, endocrinology, cell physiology, sensory physiology, and aspects of insect physiology will be studied.

**Prerequisites:** Zoology II.

**Class Requirements:** Four lectures and three 3-hour practical/tutorial classes a week for three terms.

**Prescribed Reading:** Students should consult the zoology student adviser at the time of enrolment for the course, and obtain the reading list when it is published.

## HONOURS COURSE

Honours students are required to undertake a special research project, complete prescribed courses of reading, prepare essays on selected topics, and attend and give seminars. There are no formal lectures, and hours of study are unlimited. Students who do not have qualifications in statistics may be required to complete a statistics course during their honours year.

## POSTGRADUATE STUDIES — MSc AND PhD

Research is currently in progress in the following fields: speciation on oceanic archipelagos; zoogeography of Pacific insects; zoogeography, conservation, physiological ecology and evolution of SE Australian reptiles; ecology, taxonomy and morphology of insects; population ecology of plant-feeding insects, particularly agricultural pest species; biological, chemical, and integrated control of insect pests; physiological and ultra-structural studies of insect excretion, salt and water regulation, sensory receptors; endocrine control of salt and water metabolism in vertebrates; reproductive biology of dasyurid marsupials.

Prospective students should contact the chairman of the department for further details.

# TABLE OF SUBJECTS

## PART VII: TABLE OF SUBJECTS

### SCHOOL OF AGRICULTURE

<b>Subject</b>	<b>Code No.</b>
<b>First Year</b>	
Agriculture I	630.10
Biology IA	570.11
Chemistry I	540.10
Physical Sciences IT	500.10
<b>Second Year</b>	
Agriculture IIA	630.20
Agriculture IIB	630.21
Agriculture IIC	630.22
Chemistry IIB	540.21
Biology II	
Botany IIB	580.21
Genetics IIB	570.21
<b>Third Year</b>	
Agriculture IIIA	630.30
Agriculture IIIB	630.31
Agriculture IIIC	630.32
<b>Fourth Year</b>	
Agriculture IVA	630.40
Agriculture IVB	630.41
Agriculture IVC	630.42

**SCHOOLS OF BEHAVIOURAL, BIOLOGICAL AND PHYSICAL SCIENCES**

Subject	Code	Unit Value	Prerequisite Subjects
Biochemistry II	570.24	1	Chemistry I and Biology IA or Biology IB
Biochemistry III	574.30	1	Biochemistry II
Biochemistry IV	574.40	1	Biochemistry III
Biology IA (botany and genetics)	570.10	1	For students enrolled in the School of Biological Sciences —
Biology IB (zoology and genetics)	570.11	1	Chemistry and one of biology, physics or a branch of mathematics at H.S.C. level. For students enrolled in other Schools — chemistry at H.S.C. level.
Botany II	580.20	1	Biology IA and one of Chemistry I, Physics I or a first-year mathematics subject.
Botany III	580.30	1	Botany II
Botany IV	580.40	1	Botany III or special approval of the Board of Studies.
Chemical Physics III	535.30	2	Applied Mathematics II, Chemistry IIA (Physical) and Physics II.
Chemical Physics IV	535.40	—	Chemical Physics III or an approved equivalent.
Chemistry I	540.10	1	Nil
Chemistry IIA	540.20	1	Chemistry I, Physics I or first-year mathematics unit (incompatible with Chemistry IIB).
Chemistry IIB	540.21	1	Chemistry I (incompatible subject Chemistry IIA).
Chemistry IIIA	540.30	2	Chemistry IIA (incompatible subject Chemistry IIB)
Chemistry IIIB	540.31	1	Chemistry IIA (incompatible subject subject Chemistry IIIA)
Chemistry IV	540.40	—	Chemistry IIIA <sup>3</sup>
Economics I	330.10	1	Nil
Economics IIA (microeconomics)	330.20	1	Economics I

# TABLE OF SUBJECTS

Subject	Code	Unit Value	Prerequisite Subjects
Economics IIB/IIIB (economic statistics)	330.21	0.5	A first-year mathematics subject or Social Sciences IC.
Economics IIC (economic history)	330.22	0.5	Economics I
Economics IID (accounting)	330.23	0.5	Economics I (Economics IIA and Economics IIB or Economics IIG must be taken before or in the same year as this half-unit.
Economics IIE (industrial relations)	330.24	0.5	Economics I
Economics IIG (mathematical economics)	330.26	0.5	A first-year mathematics subject or Social Sciences IC or a good pass in Social Sciences IB.
Economics IIH (introductory mathematics for economists)	330.27	0.5	Economics I (incompatible subjects Economics IIG and any mathematics subject).
Economics IIJ (business decision-making)	330.28	0.5	Economics I (Economics IIA and Economics IID must be taken before or in the same year).
Economics IIIA (monetary economics and economics policy)	330.30	1	Economics IIA
Economics IIID (economic theory)	330.33	0.5	Economics IIA
Economics IIIG (econometrics)	330.36	0.5	Economics IIB or Mathematical Statistics II
Economics IVE (quantitative economic planning)	330.44	0.5	Social Sciences IIID or Economics IIIG or Economics IIK
Genetics II	570.20	1	Biology IA and Biology IB and at least one physical sciences subject.
Genetics III	570.30	1	Genetics II
Genetics IV	570.40	1	Genetics III
Geology I	550.10	1	Nil
Geology II	550.20	1	Geology I

Subject	Code	Unit Value	Prerequisite Subjects
Geology III	550.30	1	Geology II
Geology IV	550.40	—	Geology III
Mathematics IA	512.10	1	Nil (incompatible with Mathematics IC)
Mathematics IB	512.11	1	Nil (incompatible with Mathematics IC)
Mathematics IC	512.12	1	Nil (incompatible with Mathematics IA and Mathematics IB)
Applied Mathematics II	515.20	1	Mathematics IB
Mathematical Statistics II	519.20	1	Mathematics IA
Pure Mathematics II	510.20	1	Mathematics IA and in 1974 only Mathematics IB
Applied Mathematics II	515.30	1	Applied Mathematics II
Mathematical Statistics III	519.30	1	Mathematical Statistics II, Pure Mathematics II <sup>2</sup>
Pure Mathematics III	510.30	1	Pure Mathematics II
Computer Science III	520.30	1	Normally a second-year mathematics subject or Physical Sciences II including a significant proportion of mathematics.
Applied Mathematics IV	515.40	—	Applied Mathematics III and Pure Mathematics II
Mathematical Statistics IV	519.40	—	Mathematical Statistics III and Pure Mathematics II
Pure Mathematics IV	510.40	—	Pure Mathematics III
Philosophy I	100.10	1	Nil
Philosophy IIFA/IIIFA (Formal Logic A)	100.20/ 100.30	0.5/ 0.33*	Philosophy I or two units from the Schools of Biological or Physical Sciences.
Philosophy IISA/IIISA (Philosophy of Science A)	100.21/ 100.31	0.5/ 0.33*	Philosophy I or two units from the Schools of Biological or Physical Sciences.
Philosophy IIPM/IIIPM (Philosophy of mathematics)	104.24/ 104.34	0.5/ 0.33*	Philosophy IIFA/IIIFA and a first-year mathematics unit.
Philosophy IIFB/IIIFB (Formal Logic B)	103.21/ 103.21	0.5/ 0.33*	Philosophy IIFA/IIIFA

			Prerequisite Subjects
	Value		
Philosophy IIILA (Philosophical Logic A)	103.32	0.33	Philosophy IIFA/IIIFA
Philosophy IIISB (Philosophy of Science B)	100.39	0.33	Philosophy IIFA/IIIFA or IISA/ IIISA
Physical Sciences IT	500.10	1	Nil
Physical Sciences II	500.20	1	As for each segment
Physical Sciences III	500.30	1	As for each segment
Physics I	530.10	1	Nil
Physics II	530.20	1	Physics I, first-year mathematics subject
Physics IIIA	530.30	1	Physics II, second-year mathematics subject
Physics IIIB	530.31	1	Physics II, second-year mathematics subject
Physics IV	530.40	—	Physics IIIA
Psychology I	150.10	1	For B Sc students chemistry and one of biology, physics or a branch of mathematics at higher school certificate level.
Psychology IIB	150.21	1	Psychology I and an approved biology I unit.
Psychology IIIB	150.31	1	Psychology IIB
Psychology IV	150.40	—	A pass in a bachelors degree with a major sequence in psychology.
Zoology II	590.20	1	Biology IB, and either mathematics IA or Mathematics IC
Zoology III	590.30	1	Zoology II
Zoology IV	590.40	1	Zoology III.

\* The unit value is 0.5 if presented as part of a second-year unit and is 0.33 if presented as part of a third-year unit.

1. In special circumstances, the Board of Studies may accept Chemistry IIB as a prerequisite for Chemistry IIIB.
2. Only for students intending to proceed to honours.
3. Students who have performed well in Chemistry IIIB and another third year science subject may be admitted to the course.

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Bundoora Reference  
378.9451 L364c  
1974 v.2  
La Trobe University.  
Handbook.

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